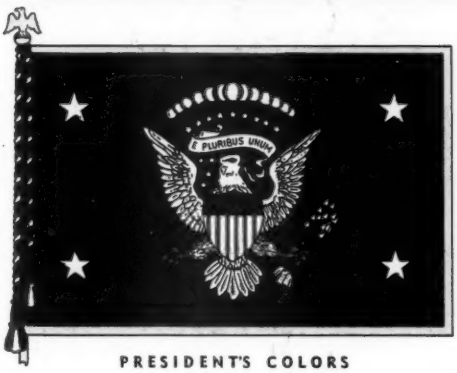
JAN 11 1943

the OIL AND GAS JOURNAL

SECRETARY OF STATE



PRESIDENT'S COLORS

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IN POINT OF RESPECT, the President's flag is second only to the flag of the United States. Emblazoned in its center is the President's Seal, which is the same as affixed to treaties, commissions and other important documents bearing his signature.

The flag is raised when the President boards ship and remains aloft until his departure. Its raising and lowering is ordinarily accompanied by a 21-gun salute. It is also flown above the White House or other place established as personal headquarters of the President during his visit.

Each of the nine Cabinet positions has its individual flag and color. Both are of the same design, varying only in size, and each has its specific occasion of proper usage.

Flags of assistants to the Secretaries and Generals in the Cabinet are the same as their superior's, except that the colors of the field and embellishments are reversed; however the device in the center of the flag remains in proper heraldic tinctures on all except flags of Secretaries of the Navy, Treasury and Commerce.

HUGHES TOOL CO. HOUSTON, TEXAS

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JANUARY 7, 1943

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EXPLORATION AND DRILLING

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Research finds the way

Every gallon of gasoline that goes into the tank of an American fighting plane contains a precious ingredient that could not have been produced except for the curiosity, the persistence, the genius of American research men

It's made by combining olefinic with paraffinic hydrocarbon molecules Chemistry textbooks for generations had taught that such a reaction was impossible and chemists generally accepted that belief

But not Universal research men They were curious They took down the forbidding sign "It can't be done" and went ahead

They found it *can* be done, discovered the best catalysts to do it and developed processes to produce alkylate in great volume — largely increasing the possible yield of 100-octane gasoline

Plentiful supplies of this super gasoline give our flyers a big advantage over the enemy — thanks to the men who didn't believe it couldn't be done

OIL IS AMMUNITION — USE IT WISELY

Universal Oil Products Co
Chicago, Illinois

Dubbs Cracking Process
Owner and Licensor

THE REFINERS INSTITUTE OF PETROLEUM TECHNOLOGY

the OIL AND GAS JOURNAL

Trends

Table showing crude-oil production by states is published on page 140

CRUDE PRODUCTION 3,869,855 bbl. daily average—down 26,910 bbl. One year ago 4,029,700 bbl.

CRUDE STOCKS 233,227,000 bbl. as of Dec. 26—up 770,000 bbl. One year ago 243,990,000 bbl.

GASOLINE STOCKS 80,228,000 bbl. as of Dec. 26—up 1,097,000 bbl. One year ago 92,806,000 bbl.

RESIDUAL FUEL-OIL STOCKS 72,962,000 bbl. as of Dec. 26—down 1,243,000 bbl. One year ago 94,216,000.

GAS OIL AND DISTILLATES 43,799,000 bbl. as of Dec. 26—down 2,081,000 bbl. One year ago 50,806,000.

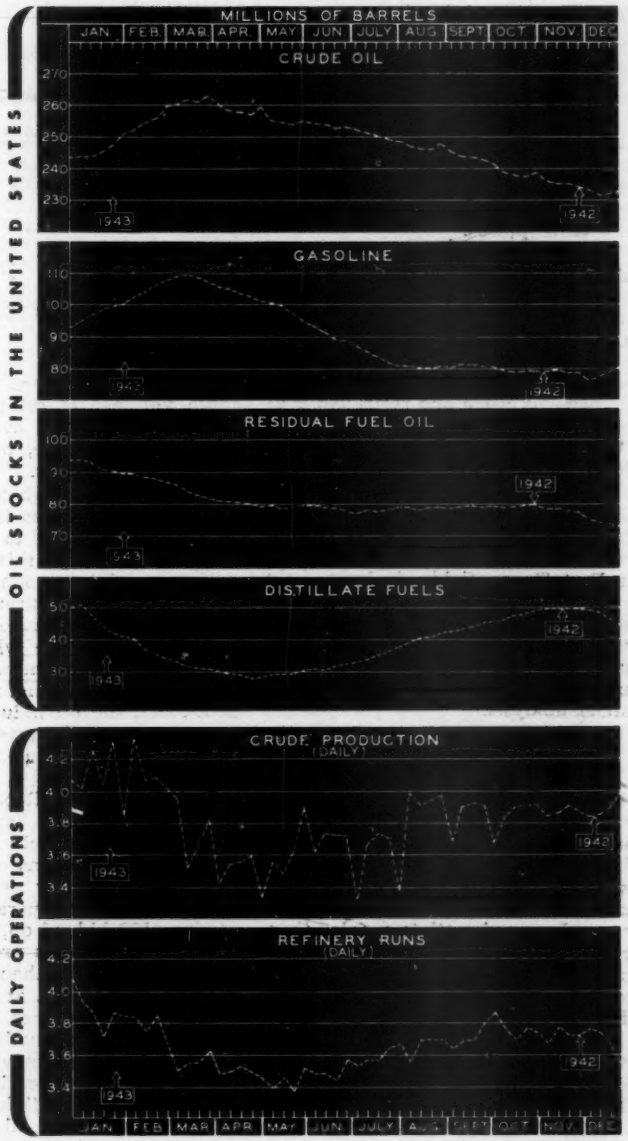
REFINERY RUNS 3,525,000 bbl. daily week ended Dec. 26—down 142,000 bbl. One year ago 4,103,000. (Refinery report delayed)

AT the start of a new year conditions arising from oil transportation were the most immediate problems being discussed at Washington and within the petroleum industry. The shortages that have developed over the past month in several eastern states are as bad as the most pessimistic predictions of last summer and fall. In November and early December those in touch with conditions were estimating the discrepancy between eastern demands and supplies at around 200,000 bbl. daily. Petroleum Administrator Ickes this week said demands including war requirements to be supplied from East Coast refineries were 1,500,000 bbl. daily or 500,000 bbl. more than current deliveries.

Economists in the petroleum industry have said that this eastern shortage is the most difficult problem they have been called upon to analyze. They do not feel that the gap can be closed with further reductions in civilian consumption and they have definite support for their position in the conditions that have developed over the past month under the present rationing program. Several take the unqualified position that further reductions will be a direct threat to the war-production program.

NEITHER do these students of conditions anticipate substantial increases in the overland movement of crude oil and products over the next few months as a solution to shortages. Deliveries through the 24-in. line from East Texas to Illinois scheduled to start next month will shorten part of the tank-car movement but there are offsetting losses such as the reduced inland water and tank-car deliveries from certain areas, unfavorable weather, and other operating conditions in the oil country.

SO far as those closest to conditions in the oil industry are concerned these investigations invariably lead to the conclusion that the only adequate answer for this year to transportation conditions lies in the return to the more normal movement of tankers. There are those who believe that more tankers will shortly be available for the coastwise movement of petroleum—others are equally positive that fewer rather more tankers will be used in transporting oil for civilian consumption to this and other countries. The belief that conditions will improve is partially predicated on the belief that Allied success in North Africa will open the Mediterranean for the movement of petroleum and end the long hauls that have been necessary from the Persian Gulf area.



How the Price of Crude Influences Exploration

by W. V. Howard

Higher prices for crude have caused increased exploration and many large discoveries in the past. Whether they would result in important discoveries today cannot be predicted but it is certain they would permit increased secondary-recovery operations so present reserves could be fully utilized.

WHEN M-68 was put into operation a little over a year ago, OPC had in mind a recession of development drilling since there was enough oil immediately available to satisfy the anticipated demand for a short time. It was expected, however, that there would be an increase in wildcatting which would lead to the discovery of additional reserves. It is to be presumed that spacing regulations would later be lifted to permit additional output from partially developed fields so that as the present prolific areas declined, the new ones would take their places.

The restriction in field drilling resulted but neither the intensive wildcat campaign nor the discovery of large quantities of new reserves ensued. Many oil companies and independent operators hold that this was inevitable in the light of the present low price of crude and restricted production from flush fields.

The relationship between new reserves found by exploration and price of crude is not a simple one. Obviously, if only one man in the United States had the incentive to drill a single well, that well might bring in an East Texas field. A large field needs only one discovery well, just the same as a small one. The relationship between the quantity of new oil found and the intensity of wildcatting is, therefore, not subject to statistical analysis.

Normal Exploration Cycle

The normal exploration cycle is as follows: As a shortage of oil develops, prices begin to rise. The rise in price spurs a steadily increasing number of operators to drill exploratory holes. As prices rise still more wildcats get farther from known producing areas or go deeper, in other words, they become more expensive since the anticipated return warrants the increased risk. Normally, the more wildcats that are drilled, the more discoveries are made but the cumulative effect of a number of small discoveries may be only enough to offset the decline in output of the old fields. However, eventually enough big fields are found to add large volumes of oil to the proven reserves and as the available supply of oil is now large, prices fall and wildcatting declines.

The period of high prices may be long or short and its length depends on the time required to find the large reserves. Although this cycle is apparently plainly recognized by PAW, other Washington bureaus have tried to reproduce it by removing the price incentive at a time when the cycle had actually commenced. As a result, it was interrupted and there is grave doubt that the oil industry will long be able to supply present demands, to say nothing of an increased demand for oil.

In previous wildcatting cycles there was another factor which is missing today, namely the ability to secure large returns quickly from new discoveries by producing them to capacity. An operator who can produce 500 bbl. of oil, even at $1 a barrel can meet his pressing obligations more rapidly than one who can produce only 50 bbl. at $2.50. Modern conservation practices do not favor the wide-open production of flush oil but that does not remove the fact that one of the two incentives for wildcatting has been withdrawn as a result. The price of oil is important only in so far as it affects the net income from production.

Proposals to subsidize the wildcatter in some way have been strongly attacked by the oil industry. The wildcatter and producer are not of different species. The money that goes into wildcats comes mainly from production and it is risked in the hope of getting more production so as to provide money for still more wildcatting. Naturally some of the returns are taken out in the form of income but most of the money that comes out of the ground goes back into it again. That is, most of what is left after taxes.

Example of Two Campaigns

Often there is heard a doubt that increased prices will help increase proven reserves. That does not imply that it will not increase wildcatting but that the wildcatting will not be successful. Two previous wildcat campaigns may throw some light on this question. The number of dry holes has exceeded 7,000 in 6 years. These were, first in 1920 when the average price of crude was $3.07; during the 4 years 1926-29, when the price was between $1.19 and $1.88, and during 1941 when the price was $1.15 and had risen from below $1, indicating the start of another cycle.

Since large discoveries were not made in 1941, this cycle should have continued through 1942 and into later years but it did not. The only apparent reason is the lack of a price increase as efforts were made to make supplies available to wildcatters.

If high prices cause wildcatting to increase, the converse should be true. The record shows that the number of dry holes drilled annually during the years 1931-33 was between 3,312 and 3,659, or approximately one-half of the number drilled during periods of higher prices.

During the two previous periods of high prices, the results of wildcatting are of great interest. There were the usual number of smaller fields found in and near old areas but as

(Continued on Page 45)

Acme

End of barge rising in the water as its oil cargo is discharged at Cincinnati, marking first deliveries through the combination Project 5 Pipe Line Co. system and the Mississippi and Ohio rivers route. Two of six barges were unloaded at Cincinnati where this picture of the unloading process was made

THIS WEEK

REFINING—Superpriority rating assigned 20 per cent of uncompleted 100-octane capacity, so completion can be rushed. . . . ¶Rest may get same special treatment, if trial doesn't interfere with Army and Navy. . . . ¶January distribution quotas assigned eastern refineries; totals lower than for last half of December, aggregate about 1,085,000 bbl. daily. . . . ¶Interior plants ordered to increase residual-fuel yields 7 per cent above last half of 1941, means sharper cut in gasoline, aggravation of operating losses, unless frozen-fuel prices are thawed. . . .

TRANSPORTATION—Administrator Ickes talking of increasing projected products line, Texas to East Coast, to 24-in. Mentions possible necessity of second products line, of 20 in., to make "dead certain" that supplies will be adequate. . . . ¶Tank cars in eastern service frozen in that traffic, by ODT order, for duration of emergency. . . . ¶Railroads pledge increased effort to haul essential supplies. . . . ¶Line from El Paso, Tex., to California discussed. . . .

RATIONING—Value of fuel-oil coupons lowered 10 per cent, in East Coast district. . . . ¶Gasoline administration tightened. . . . ¶Conflict appearing between OPA orders, PAW distributor-quota system, modification of one, possibly both regulations probable. . . . ¶OPA's Henderson criticizes public acceptance of gasoline rationing, regrets he was not "tougher," says bootlegging rampant. . . .

PRIORITIES—P-98-b reissued, assigns higher ratings to many operations. . . . ¶Operators authorized to sell inventory materials to supplier for resale to another operator, by P-98-c, also reissued by WPB. . . .

PRODUCTION—House oil committee still speaking in terms of 1 million barrels increased demand, before war is over. . . . ¶Higher imports proposed, to ease drain on domestic resources. . . . ¶Domestic independents likely to protest vigorously. . . .

SUPPLY—Administrator Ickes gears eastern quotas to daily supply of 1,117,000 bbl. . . . ¶Quotas are only 1,085,000, as assigned to primary suppliers; difference is cushion for contingencies. . . . ¶Eastern supply, last week of December, averaged 1,171,000 bbl. daily. . . .

MARKETS—Formal authorization issued lifting tank-wagon fuel-oil ceiling 0.3 cent, in 30 rationed states . . . ¶Impression widening in Washington that OPA is softening in oil-price attitude. . . . ¶House committee renews demand for higher oil prices, adjustment in product ceilings, other reliefs to stimulate discovery. . . .

DEMAND—Purchasers keep pressure on refiners, willing to contract for long-term deliveries, which refiners oppose. . . . ¶Railroads particularly anxious to augment fuel-oil supplies, for southwestern operations, which are inflated by war industries, remote from adequate coal. . . .

Several 100-Octane Units Given Super Materials' Preference

by H. Stanley Norman

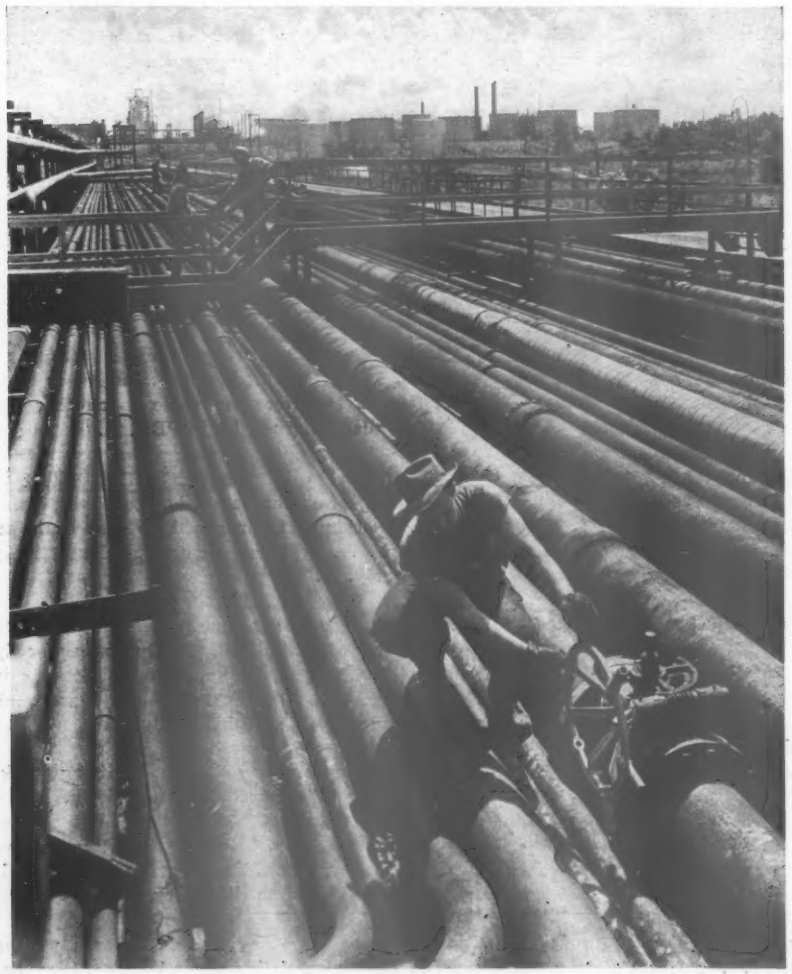
TWENTY per cent of the uncompleted capacity in the authorized 100-octane gasoline program has been assigned materials precedence over all AAA priority ratings, indicating that high government officials are throwing their support behind this substantial portion of the refinery-construction projects.

Remainder of the aviation-fuel program may be expedited by a similar War Production Board directive at a later date, if the special dispensation extended on a trial basis to the most advanced units does not unduly obstruct the Army and Navy projects.

The special WPB directive issued to expedite the flow of materials and equipment needed for the completion of approximately 20 per cent of the authorized aviation-gasoline program is quite inclusive. It takes precedence over all AAA's except in those instances where the manufactured item can be delivered at the site by January 10. The only other end use of materials having a higher priority rating than the 20 per cent of the aviation-fuel program are by special direction of the director general of operations, including those on Forms PD-637, PD-637-a and PD-637-b.

In confirming the special directive for a fifth of the 100-octane gasoline plant capacity last week, the Petroleum Administration for War cautioned those authorized to apply the super preference ratings to use particular care to avoid direct conflict with the Army and Navy orders.

Conditions culminating in the special WPB directive verified previous reports circulated in the refining industry that the lack of materials and inadequate preference position were causing the 100-octane program to fall further and further behind schedule. The industry, PAW pointed out in announcing the special directive, has gone as far as possible in conversion of existing facilities to the production of 100-octane gasoline. The disclosure added that "the major portion of the 100-octane gasoline produced today is the result of converting existing equipment."



Nerve center of a refinery, illustrating the mass of piping essential to handling products and showing one reason why super preference ratings are necessary to get materials

Manufacturers Blameless

Tardy flow of materials and equipment to the aviation-gasoline plants now under construction is in no sense a reflection on the manufacturers of such suppliers. Rather, the trouble has been in failure to channel adequate materials into plants of manufacturers of control instruments, relief valves, heat exchangers, boilers, cast iron and steel valves and forgings. Many plants qualified to produce materials needed in the 100-octane program are not now, nor have they been recently operating at capacity.

The Requirements Committee of WPB, top allocating agency under the new Controlled Materials Plan, has pledged that each manufacturer of refinery equipment producing materials for the 100-octane plants will receive sufficient supplies during the first 3 months of this year to warrant capacity production. This assurance of adequate materials for the fabricators and manufacturers of refinery equipment extended by the Requirements Committee, some observers

contend, will, on a long-term basis, prove of greater benefit to the overall program than the special directive.

No specific number of plants to which the special WPB directive applies has been announced from official sources but from other quarters it was understood to embrace 53 units. The locations, of course, are a military secret. However, it was understood that the units selected for special-material dispensation are those most advanced in construction or, for some other reason, offering speediest possibilities for completion. Another consideration was capacity. Still another factor was location with respect to demands of the military forces. Types of crude, productive capacity, availability of charging stock and transportation requirements for raw material and finished products were analyzed in determining units to which the special directive would apply.

Even with last week's favorable turn in the outlook for equipment, the PAW repeated previous suggestions for mitigating the material shortages and proposed additional alternates for the consideration of refiners. One suggestion was that refiners consider more extensive specification of welded tubing in heat exchangers. There are not enough benches, the PAW bulletin asserted, to supply drawn tubing for all the heat exchanger requirements.

Surplus Materials Listed

Refiners again were urged to make use of the list of used and surplus materials maintained by the PAW Refinery Division which is available for inspection at the Washington office. Much of the material listed is new and consists of equipment left over from completed jobs or unshipped orders originally intended for export.

"The Standard Oil Co. (New Jersey)," the bulletin reveals, "has recently listed with us quite a large quantity of equipment and materials which had been previously ordered for export to Venezuela. Included in the list are motors, circuit breakers, transformers, switches, wire, fittings, valves, tubing and pumps."

While urging refiners to avail themselves of the listed surplus materials, the PAW bulletin also invited those with excess equipment of any usable character to list it for the possible convenience of other processors. The value of offering surplus equipment to other refiners was emphasized by reference to the important part used facilities have played in meeting past obligations of the petroleum industry. Most of the plants erected for production of cumene and codimer and a large part of the butadiene units have been erected or adapted by the use of surplus materials, the bulletin declared. A pertinent point in further reliance on surplus facilities, however, is the conclusion that the industry has reached the maximum limit on conversion projects and that new plants are essential to completion of unfinished 100-octane units and to any future expansion of the program.

In order to meet the critical supply situation for certain refinery materials, some of the operating companies have used their own shops for fabrication purposes. The PAW bulletin referred specifically to recent arrangements made by Gulf Refining Co. at its Port Arthur, Tex., plant. The company arranged for delivery of unfinished heat-exchanger parts which will be finished and assembled in the refinery maintenance shops.

"Some months ago when the problem in connection with the delivery of forgings became particularly acute," the PAW bulletin says, "many refinery maintenance shops were adapted to relief of this particular situation." Rough forgings were de-

(Continued on Page 47)

The Debut

This is the first issue of The Oil and Gas Journal in its new dress and format.

Preparations for this initial number and those that will follow in this standard size started weeks ago with every department of the publication participating. Our job has been comparable to the retooling and redesign that precede the bringing out of a new model in manufacturing enterprises in which the best of what has been used before is retained and new features incorporated to more completely serve.

Our editors have taken advantage of this opportunity to better adapt features of long acceptance to reader requirements including ease in reading and convenient filing. New editorial services are included. Conciseness and yet completeness in writing and editing are emphasized.

Materials at the same time will be conserved. It is of interest in this connection that the War Production Board the past week ordered a 10 per cent curtailment, effective January 1, in the consumption of paper during 1943 compared to 1942. This reduction follows the recommendations of the magazine industry's advisory committee reflecting the wishes of publishers anxious to do whatever is advisable in the conservation of manpower and transportation involved in paper production.

It is also noteworthy that the government agencies have repeatedly expressed their appreciation of what many of the trade and business press have done over the past year in aiding industry to expand war production.

The Journal will be able to do its part in this paper reduction through mechanical adjustments and the better utilization of white space. At the same time we are enlarging the scope of our coverage of the petroleum and natural-gas industry with an arrangement and coordination of material which assures maximum returns to the subscriber and advertiser. In addition to the reduction in the use of paper, the standard size will permit savings in metal and other critical materials. Shipping requirements will be less.

The petroleum industry has the greatest responsibilities in its history this year. We believe that in our new size we are prepared as never before to report and analyze its activities from which will spring the offensive power of the nations now allied in war.

Auto-Ordnance Corp. Has Become One of Kansas' Most Active Oil Producers

by Neil Williams

This article was prepared following many inquiries to this publication regarding the background and operations of the Auto-Ordnance Corp., a war newcomer to the oil industry and a successful operator in Kansas.

WICHITA, Kans.—Entering the oil business just 18 months ago, Auto-Ordnance Corp. of New York City has become one of the most active independent developers and producers of petroleum in Kansas. Carrying on an active exploration and drilling program not exceeded by any of the previously established companies or independents this concern has had an unusually successful record in building up substantial holdings and reserves, both actual and potential.

Outside of its oil activities, Auto-Ordnance Corp. is engaged in the manufacture of submachine guns and semiautomatic rifles under war contracts with the Government. It has a large factory near Bridgeport, Conn. In this business, the company, which the present management took over in an almost defunct status in 1939, has been highly succesful financially. Exploration and development of oil has provided an outlet for some of the revenue from munitions' operations.

The company's entrance into the oil business resulted from several circumstances. First, it was accumulating a considerable cash reserve. However, the management realized that with the cessation of the war, its gun business would face an almost abrupt end. With a view to continuing the corporation after the war, it was decided to participate in a more permanent industry. The oil business was chosen because the management desired not only a business that offered a promising future but also one in which it could utilize its resources to aid the Government in supplying a vital product.

Operating headquarters of the company's oil division are at Wichita, Kans., with Gilbert P. Moore, a geologist, as manager. Before becoming associated with this company to organize its oil operations, Mr. Moore had been in appraisal and economic work, specializing in oil, since 1935 with offices at New York. Previously, he had done geological and exploration work, starting with Carter Oil Co. as a field geologist in 1920. Later, he was sent to South America for Standard Oil Co. (New Jersey) where he did exploration work until 1928. Returning to New York, he opened consulting offices.

Kansas was selected for the oil venture for several reasons. First, production in this state was comparatively shallow and offered prospect for low operating costs and fairly rapid development. This permitted the drilling of more wells than would be possible in many other areas for the same cost. Second, the prospects for increased market outlets appeared particularly favorable for Kansas crude. Third, Mr. Moore, who was to direct the acquisition of properties, had greater familiarity with Kansas conditions than with those in some of the other areas.

Operations Began Without Delay

Associated with Mr. Moore, are E. K. Edmiston, chief geologist and manager of the Kansas district; Gage W. Lee, superintendent of production, and Anthony Folger, geological consultant. Previously, Mr. Edmiston was associated with T. C. Johnston, Kansas operator, and had been a geologist in the state for many years. Mr. Lee had been an engineer with Continental Oil Co. Mr. Folger formerly was district superintendent for Gulf Oil Corp.

Within 2 weeks after the arrival of Mr. Moore at Wichita and the opening of the offices, two wells, both of which became producers, had been

Left: Completing Auto-Ordnance Corp. 3 Mitchell, Chase pool, Rice County, Kansas. Gilbert Moore, manager of oil division, is standing in foreground with Gage Lee, production superintendent. Right: Drilling Auto-Ordnance Corp. 4 Mitchell, Chase pool, Rice County, showing type of rig employed

started. Since then, the company has drilled 65 wells, and has nearly 50 producers on 21 different leases. Gross production now totals about 42,000 bbl. monthly, or at the rate of approximately 500,000 bbl. per year. Of the monthly gross, approximately 32,000 bbl. is net. Gross sales for the past month amounted to 37,500 bbl. The production rate is expected to be doubled during 1943.

Present production is in seven fields, including Lindsborg, McPherson County; Chase, Rice County; Dubuque, Russell County; Kraft-Prusa, Barton County; Lake City, Barber County; Peace Creek and Zenith, Reno County. Except for the Lake City field, located in the southern part of the state, all are in Central Kansas. The company was responsible for the opening of the important Simpson sand production at Lindsborg, and has been a major developer of the Viola lime in the same area.

Lease holdings of the company total approximately 75,000 acres, representing about 500 leases in 12 counties, namely: Rush, Ellis, Reno, Barber, Saline, McPherson, Rice, Stafford, Edwards, Barton, Russell and Cowley. (Particularly large lease holdings are in Barber County.)

Total Footage

Wells drilled represent a total footage of approximately 143,150 ft. All drilling has been with contract rigs. Peak development was reached in October when the company had 21 wells working. Operations now have been curtailed to six wells monthly, a schedule that is expected to be followed until present proved leases are drilled up.

Practically all this development has been carried out without financial assistance from other operators. In the parlance of the field, all wells have been drilled "straight up."

The record of the company is particularly interesting in that lease acquisitions and development generally were directed to properties and structures of secondary rating. Most of the production has been built up by actual drilling on the part of the company rather than by purchase. Drilling has included rank wildcats, semi-wildcats and edge wells. Including the wildcats, the producing-well completion proportion has been approximately 50 per cent.

Auto-Ordnance Corp. 1 Volker, Zenith pool, Reno County, Kansas, completed as flowing well, showing flow of fluid while cleaning

Now firmly entrenched in Kansas and with development in that state fairly well organized, the company shortly expects to extend its operations to Texas. A similar program to that in Kansas will be undertaken under the personal direction of Mr. Moore, who will leave Mr. Edmiston as manager of the Kansas work.

Auto-Ordnance Corp. is headed by J. Russell Maguire, a widely known philanthropist of New York. He is also particularly known as one of the chief sponsors of the preflight training program which has been inaugurated by the Government in various schools and institutions. It was he who sold the idea to the Government. His philanthropies are directed mainly to giving aid to students and caring for orphan children. He is a large contributor to the International Student Service, and backed the Russell Maguire Foundation and the Foster Parents Plan for War Children. He personally supports 29 foster children and operates a ranch school for children in Arizona.

INDEX FOR 1942 READY

The complete editorial index of The Oil and Gas Journal for 1942 will be off the presses this month but, deviating from previous custom, it will not be incorporated in a regular issue. The 1942 index, bound separately, will be sent without charge to all subscribers requesting a copy. Address requests to Circulation Department, P.O. Box 1260, Tulsa.

WAR EMERGENCY PIPE LINE

Special Section

starts on page 49

An entire section of this issue is devoted to a complete story of the 531-mile, 24-in. pipe line from East Texas to Illinois, the first leg of the oil-industry's most ambitious pipe-line project. The description of the engineering, operating, personnel, and economic features of the line is based on first-hand information obtained by staff members on the line and from men who have directed the program from its inception.

Price Control Abolished On 87-Octane Motor Fuel

WASHINGTON, D. C.—Aviation gasoline of 87-octane and higher rating was exempted last week from price control by OPA.

This grade of motor fuel is now allocated by government authority and the exemption was made at the request of the deputy petroleum administrator and approved by the Defense Supplies Corp. Earlier OPA action had freed gasoline of 91 octane rating and higher from price control to relieve the Government and industry of unnecessary regulations and now extends that relief to lower octane ratings for the same reason.

The new exemption is contained in Amendment 47 to Supplementary Regulation 1 under the General Maximum Price Regulation, and Amendment 52 to Revised Price Schedule 88—Petroleum and Petroleum Products. Both amendments are effective January 4.

State Capitals

TEXAS

CONSENSUS of the industry on the additional productive ability of all fields in the state is sought by a questionnaire issued last week by the Railroad Commission. Return of replies by January 15 was requested by the commission which is also asking for data on bottom-hole pressure and average gas-oil ratio in every field.

The commission asked all producers and purchasers for an opinion, "which would necessarily reflect the opinion of your engineers," on the amount of additional oil that could be produced from each and every field during a 12 months' consecutive period. The same estimate was asked for a 24 months' period.

Phillips Petroleum Co. last week settled its suit with the State of Texas by paying $182,291.50 in chain-store taxes alleged due from 1936 to 1941. The settlement was based on a court finding that service stations were subject to the tax.

Transportation difficulties which caused restrictions of the majority of Texas oil fields during the middle of 1942 caused the state's annual production to drop according to figures released last week by J. K. Baumel, director of production for the Railroad Commission. The expected 1942 production figure is approximately 478,154,000 bbl. as compared to 1941's 499,208,329 bbl.

The Railroad Commission report for the week ended December 19 shows 100,008 producing oil wells as against 99,358 at the end of 1941. To December 19, 3,006 oil wells and 230 gas wells were completed during the year while 1,386 oil wells, 77 gas wells and 1,185 dry holes were plugged.

Eighty-two of the oil wells completed were wildcats and opened new pools or extensions and 30 of the gas wells were likewise discoveries.

The state showed 731 producing oil fields and 522 gas fields in 145 counties in mid-December.

LOUISIANA

ALLOWABLE production of 339,653 bbl. daily during January was provided in the proration order issued last week by the Louisiana Conservation Department. Authorized crude-oil production this month is 17,000 bbl. higher than allowed in December.

The Petroleum Administration for War certified a quota of 347,500 bbl. daily this month in Louisiana, including natural gasoline, condensate, and other similar products.

Fields in South Louisiana were assigned 254,615 bbl. of the daily crude-oil production and North Louisiana areas were authorized to produce 85,038 bbl. daily.

Louisiana's production of natural gasoline averages around 20,500 bbl. daily.

OKLAHOMA

THE CORPORATION Commission last week set January crude-oil allowable at 370,600 bbl. daily, a reduction of 3,300 bbl. from the December authorized output. Production of natural gasoline and other petroleum oils is calculated at 30,000 bbl., lifting the total authorized output to 400,600 bbl. per day.

Prorated areas were authorized to produce 155,430 bbl. of crude daily in January and the unprorated fields were assigned 215,170 bbl. Daily average oil production in November was 358,508 bbl., the commission reported at last week's hearing in Oklahoma City, leaving a deficit of 18,922 bbl. below the allowable for that month.

Elmer Patman, chief enforcement officer and Jim Baskin, chief supervisor, oil and gas division, Texas Railroad Commission. Mr. Patman was assigned to his present post in August 1942. He is from Lynden, Tex., where he practiced law for 9 years. Mr. Baskin has been on the commission staff for 4 years, working in practically all oil departments. He has supervision over the allowable and production reports and is in charge of operating the department

South Dakota Drilling Suspended for Winter

PIERRE, S. D. — Although 29 deep test oil wells have been drilled in South Dakota since 1920 without discovering oil in commercial quantities, government encouragement of wildcat operations is likely to bring further explorations next year despite tire and gasoline restrictions, J. P. Gries, associate professor of geology at the South Dakota School of Mines at Rapid City, believes.

Drilling of four wells was begun last summer in the state and although work has been suspended on them for the winter, operations are expected to be resumed on at least some of them in the spring.

Of the 29 wells which have been drilled in South Dakota, 19 were drilled as a result of surface mapping and geophysical studies. The remaining 10 were located with no geological basis.

Oil tests have been made in 10 counties. Fall River County has had seven tests; Custer County, five; Butte, Meade and Pennington, three each; Harding, Stanley and Ziebach, two each, and Haakon and Jackson one apiece.

Two tests were made between 1920 and 1925; 15 between 1925 and 1935; one from 1935 to 1940; and 11, some of which are still in progress, since 1940.

Fall River County is the site of two of the tests begun last summer with the larger of the two wells being drilled by the Continental Oil Co. Smaller outfits started holes in Pennington and Meade counties last year.

North Dakota has also been the site of several drilling tests. The most recent was the Carter Oil Co. well in Oliver County which was abandoned as a dry hole in September 1942 at 8,850 ft. after pre-Cambrian rock was encountered at 8,831 ft.

Both North and South Dakota have been the scene of intensive oil and gas-leasing operations for the last 3 years. About 7,000,000 acres are now under lease in the two states and investigating crews have been active in the states during the last three summers, including representatives of many of the country's major companies.

Carter Oil Co., Continental Oil Co., the Pure Oil Co., Amerada Petroleum Corp., Standard Oil Co. of California, Geotechnical Corp. of Dallas, Tex., and the Independent Seismograph Service of Fort Worth, Tex., had crews in the Dakotas last summer.

the OIL AND GAS JOURNAL

PRODUCTION - TRANSPORTATION
REFINING - NATURAL GASOLINE

Founded in 1910 by
PATRICK C. BOYLE

The Oil Industry's Responsibility

AS we perused the daily press and listened to an occasional news broadcast over the past few days, we wondered just what the war worker in New England and the West Coast, and the farmer and the office worker in the Middle West and elsewhere were thinking as regards the oil business.

We wondered particularly because we, too, became confused from these daily and hourly reports as to what was going on and why, in practically everything that concerns the man-in-the-street's relation to the wartime activities of the petroleum and natural-gas industry.

There are millions whose homes have been cold because fuel-oil deliveries during a period of exceptionally low temperatures did not meet minimum requirements. Their suppliers, perplexed with a variety of directives, were helpless in a condition which involves a serious health threat.

In the East the civilian scraping bottom in kerosene, fuel oil and furnace oil has had his gasoline allocation further reduced. First he was told that this motor-fuel rationing was necessary to conserve rubber; now it is to make greater supplies available for the North African campaign.

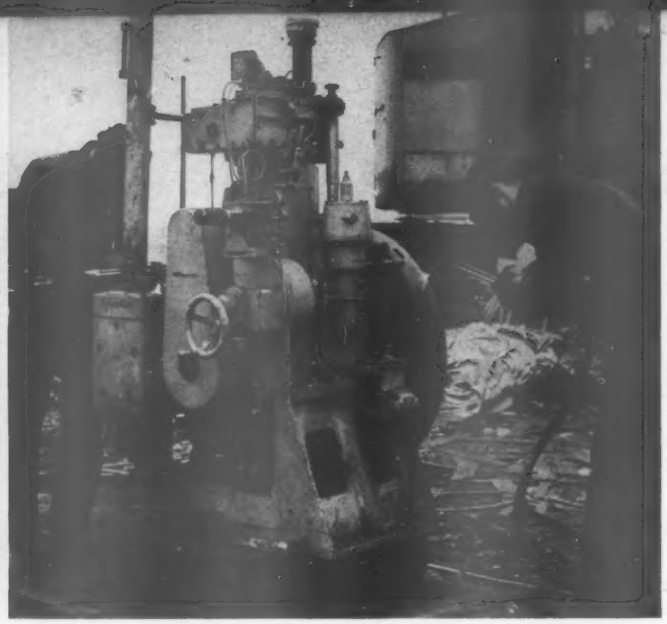
Reports from PAW, OPA, ODT, WPB, ICC, the Army and Navy and from columnists, news analysts and other observers bring little comfort to this oil-rationed citizen trying to do his part in winning the war. He is told that no relief is in sight from more tank cars or tankers. A broadcaster takes back what he said the week before and explains the "big inch" line won't be completed in time to relieve the furnace-oil shortage this winter.

Then comes About-To-Depart Henderson who wishes he had been "tougher" and places the blame on the oil consumer who failed to convert to other fuels. He overlooks the fact that most of them could not change their heating facilities to use oil substitutes and furthermore, if they had, there would have been a shortage in those fuels. Reports on the status of synthetic rubber look good one day and bad the next.

And so it goes. One Washington agency tries to clear its skirts with a forenoon statement, and another endeavors to accomplish the same thing with an afternoon release. Cartoonists are picturing it the war's best example of buckpassing.

All divisions of the oil industry can wash their hands, as many are doing, regarding these day-to-day developments and point to the lack of centralized and coordinated oil authority at Washington. We wonder if that satisfies the oilless civilian who, with the examples of what other major industries are doing, probably figures that oil supplies are primarily the responsibility of people engaged in that business. At least he must feel he is entitled to a comprehensive statement of fact.

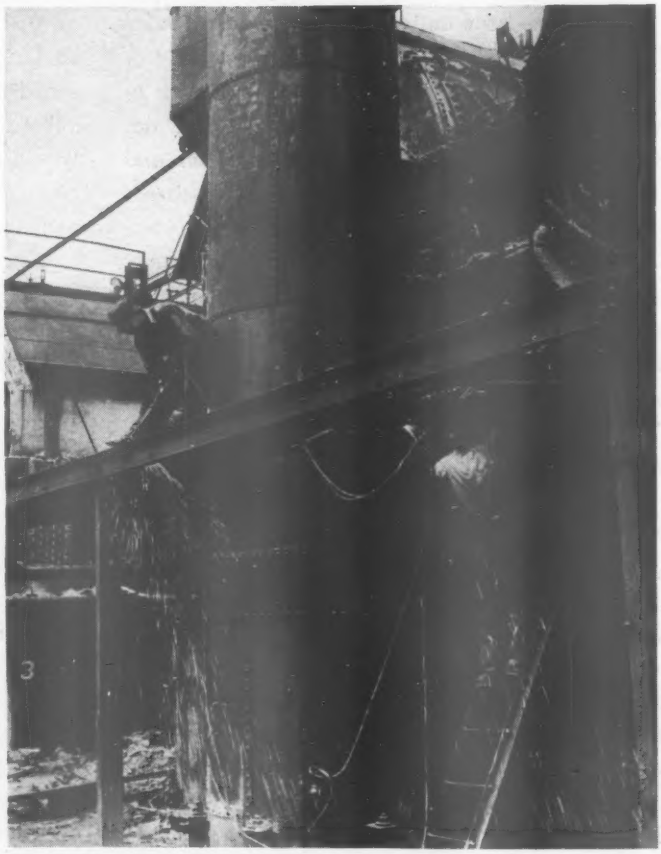
Looking farther down the road every oil man knows that there are possible future difficulties in petroleum and rubber supplies which will overshadow any that have arisen so far. Oil shortages of the past year and the resulting dislocations in our civilian economy come from transportation conditions which can be solved. At the start of a new year special consideration must be given as to what these civilians will think of this business if later this year or next they are faced with shortages because this industry permitted its operations to be so circumscribed that it did not find and produce the required oil.



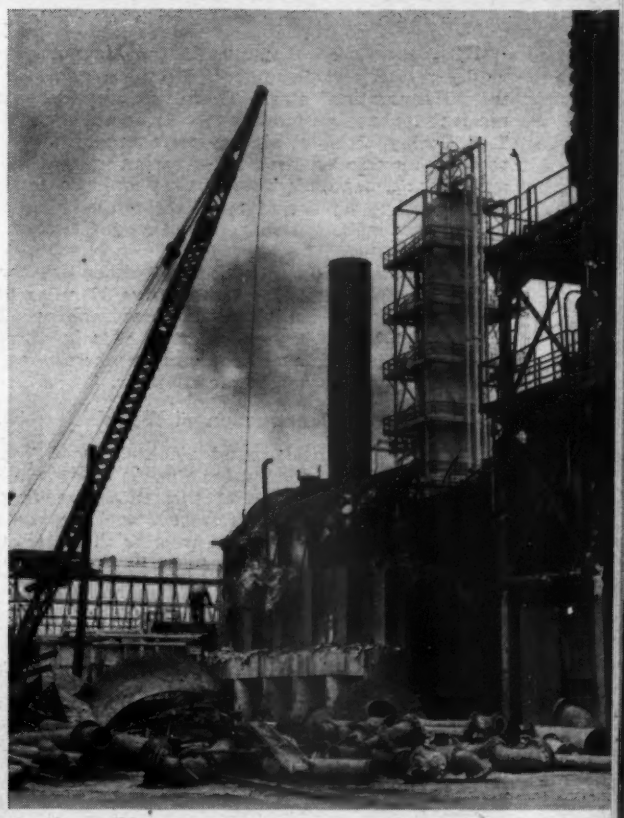
OIL-INDUSTRY SALVAGE

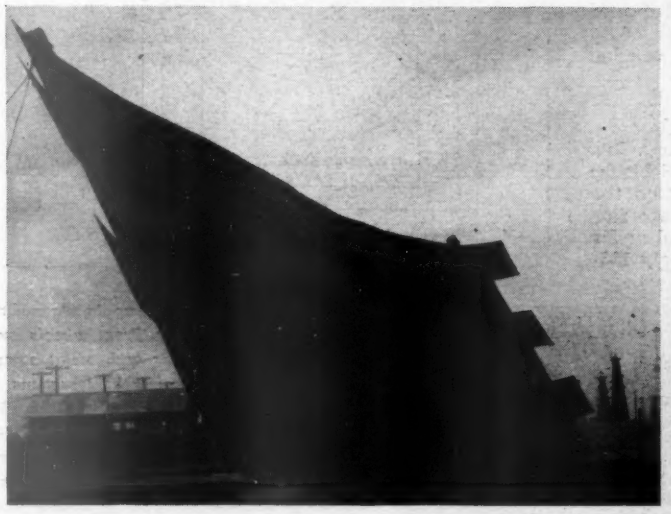
SALVAGE work has become one of the major operations at practically every petroleum installation in the country. It is a continuing process, one that requires constant supervision and results are impressive only by accumulative totals. These pictures show how the industry goes about contributing its substantial share to the salvage campaign, one of the most important phases of maintaining steel production at the levels required by war.

Upper left: A scrap warden in one large plant warns a worker against mixing qualities of metal. Upper right: Cutting down a 1-cylinder test engine used in early development of diesel motors. Right: Welders at an eastern refinery assigned to cutting down superstructures of units destined for scrap. Lower left: Workers in a West Coast refinery moving old tubes and beams to the scrap pile. Lower right: Magnetic crane handling scrap at a Pacific Coast plant

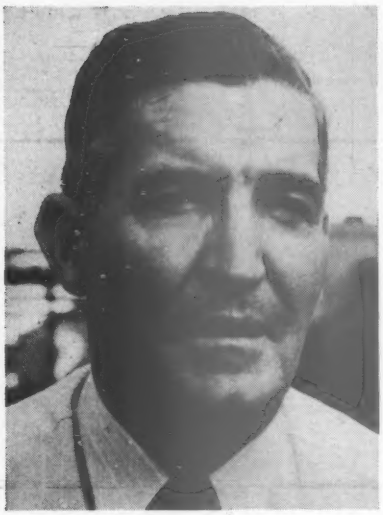


Upper left: Novel window display built partially from oil-field scrap by one of the welding companies. Upper right: Specialists in metals are assigned to sorting discarded valves, bushings, nipples, and similar small items. Right: Dismantling an obsolete still. Below: Large sections of big storage tanks are tipped over for further cutting into scrap. Lower left: M. C. Grayson, assistant superintendent of salvage, and E. E. Wood, superintendent of stores and salvage for General Petroleum Corp., stand beside one of the scrap bins placed at convenient locations. Lower right: Another example of sorting and accumulating similar types of scrap





Refinery Fire-Fighting Equipment Wooden-Wheeled



T. E. Schley, assistant superintendent of the 105,000-bbl. refinery of the Magnolia Petroleum Co. at Beaumont, Tex., designer of the wooden tires discussed here

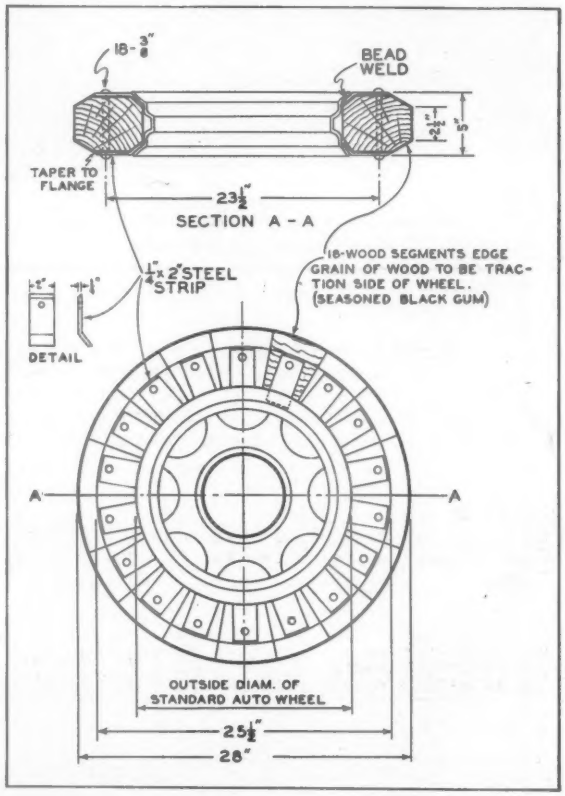
THE conservation of rubber in the Magnolia Petroleum Co. refinery at Beaumont, Tex., has gone far beyond the "investigating" stage. There, its practical application received its baptism months ago. As one of the steps taken, T. E. Schley, assistant plant superintendent, takes pride in showing his wooden-tired fire-fighting equipment. He reasoned that dependable wooden tires could be designed and constructed to replace many of the ordinary rubber tires. One spot to make the change, he thought, was on the fire apparatus.

Wooden tires approach normal rubber-tire comfort as the speed of travel is increased above 30 miles per hour. They function especially well in gravel and on oil-topped macadamized and earthen roads. Speeds in excess of 60 m.p.h. have been attained in comfort when using wooden tires on an ordinary light pleasure car.

Construction of Wheel

For a 28-in. wheel, round blocks are cut from a log, preferably black gum or water elm. As many wheel blocks as possible are made out of this cut, depending on the size of the tree. The blocks are cut oversize and are finished to size after drying. The wood is then stacked under a steam still where the temperature is approximately 120° F. for about 8 or 10 days. The end grain is run to the road as in a paving block.

As soon as the rough lumber is seasoned, the four edges are beveled, one pair taking the approximate slope of the trend of a rubber tire, while the other pair are cut to fit the steel rim of the wheel on which the wood-



Left: Wooden-tired fire pump in Magnolia's Beaumont, Tex., refinery. Front wheels contain 18 wooden sections with metal straps welded to rim of wheel to hold sections in place. Solid metal sides are used on the rear wheels instead of straps. Above: Detailed cross sections of wooden-tired, heavy duty automobile wheel. The designer recommends the wooden tires for normal duty around the refinery and has no hesitancy in recommending them on the family car for pleasure driving if travel is off old concrete pavement, brick streets, and wet clay

en-tire sections are to be mounted. The drawing indicates the assembly.

At present, Magnolia does not treat the sections with chemicals or oils to waterproof them and has purposely avoided impregnating the blocks with creosote oils as practiced in weather-proofing poles and posts. Mr. Schley has found that lumber so treated becomes brittle and dry. His objective is to retain a tough, resiliant, fibrous structure so that the ends form a continuous fibrous mat over the wearing surface.

Metal Supports

Salvaged strap iron or tank plate is used to hold the wooden sections in place depending on which of two methods is employed for block support. The two wheels on the near side of the truck reveal the use of these two forms of metal. On the rear wheel, a flat plate has been cut to fit each edge of the steel wheel. The plates have been welded to the rim along the inner edge, and the 18 wooden sections inserted around the rim and between the plates. The diameter of each plate is 2½ in. less than the diameter of the finished wheel, allowing 1¼ in. of wood to be exposed.

When using strap iron, the welding procedure is about the same, 2-in. strips of ¼-in. material being preferred. If the width of the rim is not sufficient to take sections of wood 5 in. across, the straps are bent before welding to the rim. One strap for each block is sufficient to hold the blocks in alignment and only one ⅜-in. rivet is needed to overcome centrifugal force tending to throw the block outward.

Assembly Procedure

After the wooden blocks have been cut, the metal sides are welded in place, and the wooden sections are inserted side by side, the blocks are drawn together tightly on to the metal base. This is done by pulling up with bolts a metal band passed entirely around the wearing surface of the blocks.

With the blocks held securely in position, the operator then drills ⅜-in. holes through the metal supports and the blocks. A ⅜-in. pin is passed through the three pieces and is cut and flattened on each side to form a pin rivet.

Several modifications of these simple procedures have been studied, including the insertion of rubber-belt sections between the wooden blocks to improve traction in mud and ice but these seem to add little to the plain wooden blocks.

Oil-Allocation System Being Prepared for Armed Services

WASHINGTON, D. C.—A system of allocating petroleum products among the Army, Navy, and other essential users in the East is now being worked out by the War Production Board and Petroleum Administration for War, the Senate oil investigating committee was told January 4 by J. Howard Marshall, PAW general counsel.

Mr. Marshall interjected this information while Price Administrator Leon Henderson was testifying that bootlegging of gasoline was greater than with any other rationed commodity that OPA is taking steps to tailor its ration coupons to fit estimates of available supplies as certified by PAW.

The PAW counsel said the plan now under discussion calls for the WPB Requirements Committee to pass on all demands for petroleum products of the armed services, lend-lease, war production factories, civilian activities, and other claimant agencies and to scale down these demands to fit available supplies. He did not elaborate and other PAW officials explained that the plan is still in the discussion stage but that the result might be placing petroleum along with steel, copper, and aluminum under the Controlled Materials Plan or a somewhat similar allocation system for oil, at least on the East Coast. While it was not so stated, it was presumed that such a system would prevent draining East Coast supplies by unscheduled liftings by Army and Navy.

Maloney Calls Hearing

The committee hearing was called by Chairman Maloney of Connecticut to obtain information on the present oil situation from Administrators Ickes and Henderson, Rubber Director Jeffers, ODT Director Eastman, and Maritime Commission Chairman Land. All agreed that there is little prospect for increasing the supplies of petroleum products to eastern consumers this winter, but that west of the Alleghenies there should be no need for further curtailment.

Mr. Ickes said that East Coast deliveries are now about 1,000,000 bbl. daily as against a demand, including "some military," of 1,500,000 bbl., and that rations may have to be cut further until March when the end of the heating season and anticipated deliveries by the 24-in. pipe line to Illinois may ease the situation.

Starting now, he said, the Army is releasing steel drums which will be used to ship kerosene to New England in box cars now returning empty from the Southwest. He said application for a products pipe line from Texas to New York now pending before WPB may be changed to 24 in. instead of 20 in. as now requested, and if it is approved construction could be started in February and completed by December. Still a third pipe line may be requested in the near future to be "dead sure" of supplying all needs, including military offshore requirements which are certain to expand, Mr. Ickes said. He urged a continuous program of tank-car construction to replace cars wearing out and those robbed from the West and Southwest.

New Plans Under Way

Mr. Henderson told the committee OPA is working with ODT in revising the gasoline-rationing system for commercial vehicles to reduce consumption and is simplifying gasoline and fuel-oil questionnaires and is working on new plans for supervising kerosene distribution.

Mr. Jeffers announced that starting about April 1 he will institute a new system of rationing petroleum products for all products he needs for farming operations unless he also engages in for-hire trucking. In the meantime, he has directed OPA and ODT to give local ration boards authority to ignore existing regulations to the extent necessary to keep farmers supplied. He said west of District 1 there should be no need for further restrictions on gasoline to save rubber, and promised that new regulations give local ration boards authority to adjust mileage rationing to western conditions.

Discussing the synthetic-rubber program, Mr. Jeffers said there is still some conflict with the armed forces over priorities on critical materials. But he insists that construction of rubber plants be completed ahead of everything else, even where this conflicts with the aviation-gasoline program.

Oil Truckers Continue To Increase Tonnage

Highway transporters of petroleum products, accounted for 13.5 per cent of the total tonnage reported to the American Trucking Association for November. The tonnage showed an increase of 1.8 per cent over October, and a remarkable increase of 98.7 per cent over November 1941.

Higher Preference Ratings Assigned by Reissued P-98-b

Oil operators were assured a somewhat improved priority position in obtaining supplies valued at less than $500 in revision of P-98-b which was issued last week by WPB. Pertinent provisions of the revised order are reproduced with this analysis of changes from previous regulation.

WASHINGTON, D. C.—Higher preference ratings on the delivery of materials required for the production, transportation, refining or marketing of petroleum were assigned last week by WPB under provisions of Preference Rating Order P-98-b, on the recommendation of the Petroleum Administrator for War.

The higher preference ratings will speed up the acquisition by petroleum operators of materials necessary to the maintenance of efficient wartime production of petroleum and products, according to Petroleum Administrator Ickes.

Preference ratings of A-2, A-1-A or AA-2X now apply to the delivery of materials required for completing alterations involving the use of additional materials valued at $500 or less, for materials required exclusively for research investigations with currently available research facilities, for materials necessary for repair, maintenance and operating supply purposes, and for materials to be used in any operation directly incident to the discovery, development or depletion of petroleum pools.

Four Exceptions

The new preference ratings do not apply to the acquisition of materials:

1. Otherwise obtainable on the date required.

2. The use of which can be eliminated through substitution of less scarce materials or by changes of design that will not seriously reduce operating efficiency.

3. In excess of a 90-day supply, except by special authorization.

4. Restricted or prohibited by other orders or regulations of the WPB or of equivalent authority in the Dominion of Canada.

Applications of preference ratings under P-98-b must be certified by a duly authorized official of the operator for each contract or purchase order.

In certain instances, prior approval of application of preference ratings must be obtained from the director general of operations. Some certifications will require the countersignature of district directors of materials for the Petroleum Administration for War.

Advance approval of preference ratings shall be obtained through the Petroleum Administrator for War, according to Robert E. Allen, acting deputy petroleum administrator. He said:

"This assistance will be given with all possible speed, as will the required countersignatures required of district directors of materials, in order to implement fully the purposes of the new preference ratings."

Preference Rating Order P-98-b will remain in effect until revoked.

Methods of applying the preference ratings extended by P-98-b, following the customary definitions of what is meant by the terms "operator," "supplier," "petroleum," 'materials," "petroleum industry," etc., are set out in these quotations from the order:

How to Apply Preference Rating

"1. The operator must endorse on, or attach to, each contract or purchase order placed by him which includes such a preference rating, a certification in the following form, signed manually or as provided in Priorities Regulation 7 (§944.27) by an official duly authorized to such purpose:

> The undersigned purchaser hereby represents to the seller and to the War Production Board that he is entitled to apply or extend the preference ratings indicated opposite the item shown on this purchase order and that such application or extension is in accordance with Priorities Regulation 3, as amended, with the terms of which the undersigned is familiar.
>
> ....
> (Name of purchaser) (Address)
>
> By ....
> (Signature and title of duly authorized official) (Date)

and

"2. The operator shall obtain the approval of the director general for operations before the rating is applied in any case:

"(i) Where the delivery of an item which has a cost to the operator of $500 or more requires the application of an A-1-a preference rating; or

"(ii) Where, except as provided in paragraph (e) (3) (iii), the delivery of an item requires the application of an AA-2X preference rating.

"In order to obtain such approval, the operator shall communicate to the Petroleum Administration for War, Washington, D. C., Ref. P-98-b, the information set forth in paragraph (f).

"3. The operator shall obtain a countersignature on the purchase order of contract before the rating is applied in any case:

"(i) Where the delivery of an item which has a cost to the operator of $100.00 or more requires the application of an A-2 preference rating; or

"(ii) Where the delivery of an item which has a cost to the operator of less than $500.00 but more than $5.00 requires the application of an A-1-a preference rating, or

"(iii) Where there has been an actual breakdown or a suspension of operations and where the delivery of an item which has a cost to the operator of less than $500.00 requires the application of an AA-2X preference rating.

Countersignature Instructions

"In order to obtain such a countersignature the operator as defined in paragraph (a) (2) (i) shall submit the purchase order or contract to the District Director of Material of a District Office of the Petroleum Administration for War, and the operator as defined in paragraph (a) (2) (ii) shall submit the purchase order or contract to the Oil Controller, Dominion of Canada. In order to obtain a countersignature pursuant to paragraphs (e) (3) (ii) and (e) (3) (iii) such operator shall communicate to the district director of materials or to the oil controller the information set forth in paragraph (f).

"4. In the event that the material specified in Exhibit A is to be used in service station operations, the operator shall obtain the countersignature of the district director of materials or of the oil controller on the purchase order or contract before the rating is applied in any case:

"(i) Where the delivery of an item which has a cost to the operator of less than $100.00, requires the application of an A-2 preference rating, or

"(ii) Where the delivery of an item, which has a cost to the operator of $5.00 or less, requires the application of an A-1-a preference rating.

"Provided, that in applying a preference rating assigned by this order, no operator shall alter the customary designation of any item or subdivide an ordinary purchase of any item for the purpose of making it appear that the item costs less than $500.00, or that the item costs less than $100.00,

or that the item costs $5.00 or less.

"(f) Information. Wherever required by this order the following information shall be submitted by an operator:

"(i) Date of actual breakdown or suspension of operations and exact explanation as to what extent operations are affected (if applicable);

"2. The equipment to be repaired and its function in maintaining continuous operation (if applicable);

"3. Price, quantity, approximate weight and detailed description of necessary material; if such material in finished form weighs 25 lb. or less, the weight need not be shown but a statement must be made that the weight is not over 25 lb. (detailed description of material must be given even though it is set forth in purchase order or contract);

"4. A general description of the metals contained in the material applied for, and the full justification as to the necessity for any material containing metals adjudged critical by the War Production Board, including copper, nickel, chromium, zinc, tin, aluminum and molybdenum;

Inventory Reports Required

"5. The supply of the necessary material which the operator has on hand;

"6. The name and address of the supplier (or suppliers) and the earliest delivery dates assured by him for the delivery of the minimum necessary quantity of material on (i) the preference rating for which approval is requested, and (ii) the next lower preference rating assigned by this order;

"7. The purchase order or contract shall not be sent to the Petroleum Administration for War, Washington, D. C., but in every instance the number and date of the purchase order or contract must be transmitted to the Petroleum Administration for War, Washington, D. C.; and

"8. Any other data or information which will help to determine the importance or urgency of the material for which application for rating is made.

"(g) Additional preference rating assistance. (1) If the preference ratings assigned by this order will not enable an operator to obtain material on the date when such material is required, the operator may file a PD-1A application for an improvement of the ratings assigned by this order.

"2. If there has been an actual breakdown or a suspension of operations and if the preference ratings assigned by this order or the method specified in paragraph (e) for applying these ratings will not permit an operator to obtain material on the date when such material is required, the operator in order to obtain material for this emergency may communicate by letter or telegram with the Petroleum Administration for War, Washington, D. C., Ref.: P-98-b, supplying the information set forth in paragraph (f).

"(h) Exception of operators from provisions of Preference Rating Orders P-43, P-46, and P-100. No operator to the extent that he is engaged in the petroleum industry and is covered by this order shall be entitled to apply the preference rating or ratings assigned by Preference Rating Orders P-43, P-46, or P-100, and no operator to the extent that he is engaged in the petroleum industry and is covered by this order shall be subject to the provisions of Preference Rating Orders P-43, P-46, and P-100.

"(i) Communications. All reports which may be required to be filed hereunder and all communications concerning this order shall, unless otherwise directed, be addressed:

"1. By any person located in the United States, its territories or possessions to: Petroleum Administration for War, South Interior Building, Washington, D. C., Ref.: P-98-b.

"2. By any person located in the Dominion of Canada to: Office of Oil Controller, Dominion of Canada, Toronto, Canada, Ref.: P-98-b."

The sale of inventory stocks of materials by an oil operator to an oil-industry supplier for direct resale to another operator is now permitted by WPB Preference Rating Order P-98-c, as amended upon recommendation of the Petroleum Administrator for War.

The object of the order is to permit supply houses to negotiate the sale and delivery of materials between operators. Acting in the capacity of brokers the suppliers can facilitate movement of these materials.

Previously the order only permitted the sale of inventory stocks by one oil operator directly to another oil operator.

Ohio Oil Absorbs Illinois Line

FINDLAY, Ohio.—With dissolution of Illinois Pipe Line Co., properties of the firm have been assigned to two organizations, according to a recent announcement of O. D. Donnell, president, Ohio Oil Co. One of these is a separate pipe-line department set up within the Ohio Oil Co.; the other is the Illinois Pipe Line Co. of Texas.

Illinois Pipe Line Co. was incorporated in Ohio, November 27, 1914; it was dissolved December 16, 1942. The company owned and operated a common carrier crude-oil pipe-line business in Ohio, Indiana, Illinois, Kentucky, Montana, Texas and Wyoming. All stock in the company was owned by Ohio Oil Co.

The old Illinois company wound up its corporate affairs as of December 31, and conveyed to Ohio Oil Co. all of its property and assets of every kind and character, including the transfer of all of the stock of Illinois Pipe Line Co. of Texas. Ohio Oil Co. took over all of the former Illinois company's pipe-line property in Ohio, Indiana, Illinois, Kentucky, Montana and Wyoming. Ohio Oil Co. has adopted all applicable tariffs and will engage directly in the common-carrier business in these states.

All of the affairs and properties of lines located outside of Texas are now in the name of Ohio Oil Co.

Charles Bunje, Jr., has been elected vice president of Ohio Oil Co. and appointed manager of the pipe-line department. O. F. Moore has been appointed assistant secretary and C. H. Gompf, assistant treasurer of Ohio Oil Co.

Other appointments affecting Ohio Oil Co.'s new pipe-line department are: General superintendent, P. W. Hennessey; superintendent, Lima division of trunk line, P. E. Thompson; superintendent, Martinsville division of trunk lines, Oscar Jaco; superintendent, Bridgeport division, E. C. Welch; superintendent, Rocky Mountain division, R. M. Sackett; superintendent, communications system east of Mississippi River, R. M. Slough.

It was also announced at the general office here that, effective January 1, H. F. Moran retired as manager of the Findlay and Mount Pleasant (Michigan) divisions after 49 years of service with Ohio Oil Co. Glenn Bish has been appointed to succeed Mr. Moran.

A new pipe-line corporation known as Illinois Pipe Line Co. of Texas was organized on December 15, 1942, under the laws of Texas. On that date the old Illinois company transferred to the new Texas corporation all of its pipe-line properties in Texas, consisting principally of its West Texas gathering system serving the Yates pool, Pecos County, and the East Texas gathering system, serving Rusk, Smith and Cherokee counties.

Directors and officers of Illinois Pipe Line Co. of Texas are, directors: Charles Bunje, Jr., O. F. Moore, both of Findlay; R. N. Montgomery, R. C. Gwilliam and Clayton L. Orn, of Houston, Tex. Officers: President, Charles Bunje, Jr.; vice presidents, O. F. Moore and R. N. Montgomery; secretary, O. F. Moore; treasurer, C. H. Gompf; assistant secretaries, F. M. Carpenter and Clayton L. Orn; assistant treasurers, R. N. Montgomery and D. E. Winterrowd; cashier, G. B. Steile, of Houston, Tex.

Lower Oil Quotas Assigned To Eastern Consumers

by Henry D. Ralph

WASHINGTON, D. C.—Further restrictions on consumption of petroleum products in the Atlantic Coast states were seen to be inevitable after a series of conferences of government officials throughout most of the holiday week failed to develop any solution to the transportation problem.

January quotas for sales by primary suppliers in District 1 which were issued by the Petroleum Administration for War total considerably less than consumption in recent weeks, and the Office of Price Administration took steps to tighten its gasoline-rationing system and to force conversion of fuel-oil burners to coal.

Railroad executives and government officials concerned were called to the White House by James F. Byrnes, director of economic stabilization, to consider ways of increasing tank-car shipments, and following this conference the Office of Defense Transportation issued an order prohibiting the withdrawal of any tank cars now being used in the East Coast petroleum service.

The railroad executives pledged to take all possible measures to increase the efficiency of tank-car movement, and Mr. Byrnes announced that an effort would be made to obtain steel drums from the Army to move additional oil in box cars and that experiments were proceeding satisfactorily with a "cell" of canvas and synthetic rubber for shipping oil in box cars.

Considerable confusion has resulted over the operation of Petroleum Administrative Order 1 issued by PAW December 21. This in effect sets up a rationing system for distributors of petroleum products in District 1 in addition to the OPA system of coupon rationing of gasoline and fuel oils to consumers.

Under OPC Directive 59, which has been in effect for several weeks, District 1 is divided into six zones and primary suppliers in each zone are given quotas of the four primary products—gasoline, kerosene, distillate fuel and residual fuel—which they may obtain, and all tank-car shipments must be in train-load lots delivered to designated terminals. Order 1 establishes a quota for deliveries each month by each primary supplier in each zone for each of the four products. This quota is based on anticipated deliveries under Directive 59. For the last week in December these quotas totaled 1,171,000 bbl. daily, and at that time it was announced that the January quotas would be 1,117,000 bbl. daily for all products.

Actual quotas for January, published in the Federal Register January 1, total only 1,085,000 bbl. daily, but it was explained by PAW officials that this does not mean a reduction since the difference from 1,117,000 bbl. constitutes a pool for reserves and adjustments and for small primary suppliers near the border of District 1 who have not yet been assigned specific quotas. An amendment to Order 1 permits primary suppliers to exchange products without charging such exchanges against their quotas.

Because it was recognized that the quotas under Order 1 totaled less than the amount called for by outstanding OPA ration coupons, this order permitted primary suppliers to give preferential treatment in deliveries to users listed in "Schedule B," covering war production, utilities, public transportation, and services indispensable to the public health and safety. To amplify this, PAW issued "Interpretation 1" listing in some detail municipal and commercial services considered to fall within the meaning of Schedule B, and including almost all commercial uses of fuel oil and gasoline except theaters and amusement houses. Because this list was divided into numbered groups many dealers felt that the numbers constituted preference ratings under a new priority system, although Order 1 states that there shall be no discrimination among Schedule B deliveries.

When it became apparent that distributors were interpreting Order 1 as a rationing system for consumers the OPA objected on the ground that PAW has no authority to ration to consumers and that operation of this order might invalidate its coupon system. Conferences are now in progress in an attempt to alter either Order 1 or the coupon system, or both, in order to fit them together and to adjust rationed demand to anticipated supply.

House Committee Repeats Demand For Increased Petroleum Prices

WASHINGTON, D. C.—Higher prices for petroleum and government action to increase discoveries and reserves were among recommendations in a year-end report made by the petroleum subcommittee of the House committee on interstate and foreign commerce.

Rationing of gasoline and fuel oil was endorsed as necessary to conserve petroleum products for war uses, but the rationing agencies were urged to make the systems as simple and equitable as possible.

The report was a general discussion of developments in the oil industry since the outbreak of the war. Among its highlights were the following:

The zenith of our capacity to meet oil requirements from domestic production has passed. In view of the increasing war consumption of petroleum and the fact that the war plans must provide for 2 or 3 years in advance, it is imperative that additional reserves be discovered to assure that production will meet war demands. The importance of new discoveries is so great that necessary incentives to accomplish them must be established.

To remove handicaps to increased production, the committee recommended steps to give the industry more skilled manpower; an increase in the price of crude to compensate for increased production costs; elimination of the government threat to terminate depletion tax allowances; greater supplies of steel and other production materials.

Anticipating war needs for 1,000,000 bbl. a day more than is now being consumed for all purposes, the committee said that producing fields should not be overcrowded by wasteful methods of production, and in addition to bringing in new domestic fields steps should be taken to obtain more oil abroad.

The committee was highly critical of price ceilings on refined products at less than the cost of production, declaring this to be an unwise governmental policy.

How the Price of Crude Influences Exploration

(Continued from Page 30)

prices rose exploration moved out and down. The first period of high prices closed with the discovery of Burbank, Long Beach, and other Los Angeles Basin major fields, the opening of West Texas and the Panhandle, the discovery of El Dorado and Smackover and other major fields in new areas or deep pays in old areas. The second period of high prices ended with Oklahoma City and East Texas followed by many other fields

Iu both cases, the new fields led to the discovery of still others of the same type and in the same general areas. Thus, the wildcatter led the way into new districts and from the results of his drilling these new regions developed into producing areas of major importance.

Prices Stimulate Search

During both periods of high prices, the older areas showed little, if any increase in reserves and not much change over normal years. Those areas, where undrilled, were largely leased up and would have been drilled anyway. Thus high prices, although they cannot be said to have caused the discovery of new oil, definitely sent wildcatters out looking for it.

This does not answer the question as to whether increased prices today would again uncover large reserves of oil as a result of wildcatting. No person knew in 1920 or in 1926 that wildcatting would have that result either. In fact, at that time many men were predicting that the nation had reached its peak of reserves. However, if the search for new fields fails there is a known supply of very large proportions which cannot be produced except at higher prices. In fact, development cannot be started except at higher prices. This is the oil producible by secondary recovery. The importance of these reserves has been stressed by many state surveys and by the Interstate Commerce Commission. In this issue of the Journal members of the Illinois State Geological Survey state the case for secondary recovery there. Low prices for oil at the present time, coupled with high prices for equipment not only postpone the time when this oil will become available but actually waste much of it. Operators whose wells are below the economic limit of production are now abandoning their leases. The remaining reserve of oil may be lost because of the additional expense of redrilling.

Thus, increased prices for crude have uncovered new reserves in the past and if they do not open up any new areas now, they will at least enable the oil industry to utilize fully the reserves now available to it.

Federal Order Digest

OPA Price Orders

Fuel—RPS 88, Amendment 51: Changes the base date upon which maximum gas prices are determined from October 1941 to May 1, 1942, effective January 2.

Petroleum and Petroleum Products—RPS 88, Amendment 52: Exempts aviation gasoline of 87 octane and higher ratings from price control. Companion Amendment 47 to Supplementary Regulation 1, provides for similar exemption, effective January 4.

Fuel Oil—RPS 88, Amendment 53 and MPR 137, Amendment 15: Authorizes 3/10-cent per gallon increase in tank-wagon prices in 30 rationed states and District of Columbia.

OPA Price Orders

Petroleum Products — RPS 88, Amendment 55: Liberalizes interpretation of maximum prices for individual suppliers to encourage bidding on government contracts, effective January 7.

OPA Price Orders

Rubber—RPS 56, Amendment 2: Brings sales of reclaimed rubber of all types, except scrap products containing synthetic rubber, under one regulation, effective December 31.

Synthetic Rubber—GMPR 2, Supplementary Regulation 1, Amendment 49: Removes synthetic rubber from price control, effective January 6.

OPA Rationing Orders

Automobiles—RA 2-A, Amendment 21: Liberalizes restrictions on purchases; enables persons engaged in any gainful occupation or in work contributing to the war or public welfare to buy new 1942 cars with a list price of $2,500 or more and new 1941 or earlier models that have gone less than 1,000 miles, providing need is shown in traveling to and from work, effective January 5.

WPB Limitation Orders

Office Supplies—L-73, amended: Prohibits production of metallic file fasteners, desk pencil sharpeners, certain other office supplies, effective January 1-15.

Asphalt—L-227, Interpretation 1: Explains that restrictions applied to asphalt or tarred roofing products and asphalt shingles affect only those materials and do not limit manufacture of building papers and other tarred materials, issued December 29.

Natural Gas—L-31, amended: Authorizes Director General for Operations of WPB to prohibit delivery of gas to a consumer who has auxiliary equipment but who fails to convert facilities, effective January 1.

Print Paper—L-244: Limits publishers of magazines to 90 per cent of the tonnage of paper used during 1942; specifies that no more than 22.5 per cent of last year's total tonnage may be consumed in each quarter of 1943, effective January 1.

WPB Preference Orders

Petroleum Equipment — P-98-b, amended: Extends higher priority ratings on the delivery of materials required for the production, transportation, refining and marketing of petroleum, effective December 31.

Lead—M-38: Indefinitely extends regulation on shipments and deliveries of lead, effective December 31.

Iron and Steel—M-21-b, amended: Provides temporary supplementary quotas designed to enable iron and steel warehouses to rebuild their stocks, provided total allotment for January 1 to March 31 is not exceeded, effective December 31.

Priorities Regulation 1, amended: Permits persons who have purchased material with assistance of preference rating to sell it or make use of it for purposes other than the one for which it was originally obtained, under certain circumstances, effective December 30.

Priorities Regulation 3, amended: Provides simplified form for telegraph or telephone applications for rush preference orders, effective December 28.

Petroleum Equipment — P-98-c, amended: Permits sale of operators' inventory stocks to a supply house for direct resale to another operator, effective December 31.

WPB Administrative

CMP B-1 and B-2 lists, including 500 groups of retailed items classified as B products, have been completed and will be available in printed form in 2 weeks.

Petroleum Administrative Orders

Petroleum Supplies—Order 1, amendment 2: Sets definite quotas for January, specifying daily quantities of gasoline, kerosene, distillate fuel and residual fuel oil primary suppliers may distribute in January, effective January 1.

Credit Cards—Directive 62: Abolishes use of most credit, courtesy and identification cards for the credit purchase of petroleum products, effective January 1.

ODT Orders

Tank Cars—ODT 7, Revision 1: Freezes in eastern petroleum service all tank cars operating in that traffic on or after issuance of revised order, effective December 29, 1942.

Texas Producers Capacity Declared Adequate for War

by Ernest O. Thompson*

THE oil industry enters 1943 with a positive assurance of a firm and constantly rising demand for crude oil and all its products.

The Petroleum Industry War Council at its last meeting of the old year stated that the demand for all oils would be increased by 400,000 bbl. per day by the third quarter of 1943. With a war on, which is a mechanical war, with oil as its motivating and propulsive energy keeping their airplanes flying and tanks rolling and ships plowing through the seas, and with a civilian population under rationing crying for more oil and its products throughout the land, there can be no question but what the demand is firm now, next month, and for the months to come.

Surely the Petroleum Industry War Council has a firm grasp upon the needs from the Army and Navy as to the requirements of petroleum and its products. Stocks of crude above-ground in storage are, in the opinion of many, perilously low; as a matter of fact, they are rapidly approaching a 20-year low. Stocks today stand at 234,000,000 bbl. This is the lowest in 20 years except for the one period in 1939 when stocks dropped to 229,000,000 bbl., only 5,000,000 bbl. below the present level.

We have steadfastly contended that a greater stock should be kept on hand. Happily, the question of how much crude should be produced, which in turn governs how much is in storage at all times, has been placed in the hands of the Petroleum Administrator for War. So, if it should be decided that stocks are too low, they can be built up at the discretion and upon the orders of the PAW. The authority is definitely now in one place. The Petroleum Administrator for War has a grave responsibility and we feel it the duty of everyone to follow his orders implicitly. Texas is going to do exactly that.

East Texas Water-Oil Ratio

The adoption of the new water-oil ratio rule in the East Texas field is a scientific advance in the production of oil from fields which have a known water drive. The East Texas field can produce 650,000 bbl. per day of fluid. This fluid can be all oil or oil and water combined. I mean by this that 650,000 bbl. of fluid can be withdrawn from the field per day and still the bottom-hole pressure can be maintained at its present level of 1,017 lb. per sq. in. Thus we must consider how much salt water is being produced and then subtract from that amount of salt water produced the amount of salt water that is returned to the structure to ascertain the amount of oil that can be produced without causing a drop in the bottom-hole pressure. For example, if 450,000 bbl. of water is produced and 200,000 bbl. of salt water is returned to the structure, that would mean net water of 250,000 bbl. Subtract this 250,000 bbl. of water from the 650,000 bbl. of fluid that can be withdrawn and you have 400,000-bbl. balance of oil that can be withdrawn from the field without waste. As you increase the amount of water that is returned to the reservoir, then obviously you can increase the amount of oil that can be saved each day from the field. If all the water that was produced was returned to the reservoir, then the field could produce 650,000 bbl. of oil because it does not reduce the pressure any more to produce oil than it does to produce water.

E. O. Thompson, member of the Texas Railroad Commission, explains in this statement some of the reasons he believes Texas can supply the additional crude oil considered essential to prosecution of the war. A particularly strong plea is made for reinjection of salt water in East Texas which, he contends, will be the equivalent of discovering another major field, if adopted on a comprehensive basis.

Then it follows that, if you tell us how much oil you desire to take from the East Texas field in any amount of less than 650,000 bbl., that amount of oil can be produced without waste by simply reducing the water-oil ratio from 10 to 1, which we have established as a starter, down to 0, which would allow 650,000 bbl. per day to be produced. For example, if it became necessary and desirable to produce 150,000 bbl. more crude oil from the East Texas field, then all that would be necessary in order to produce this amount would be to reduce the water-oil ratio to 5 to 1, namely, to permit only 5 bbl. of water to be withdrawn to each barrel of oil and this would increase the production of oil from its present 360,000 bbl. to 510,000 bbl.

The adoption of this rule and its prompt enforcement will be the equivalent of the discovery of a new 600,000,000-bbl. oil field. By allowing a bonus for the reinjection of water and providing the means for the same so every operator can comply, the commission has done no violence to the marginal-well law.

As a matter of fact, it is much better to save and produce oil from existing fields than it is to discover a new field in the present scarcity of materials. The East Texas field is already fully equipped with wells and pumps and pipe lines and every facility that is needed to handle the oil, whereas a new field would require much critical material. It is my considered opinion that the 990 wells in the East Texas field that are now being flowed by jetting with gas will go back to flowing naturally under their own pressure when sufficient water is reinjected into the reservoir. The salt-water company has plans on the way now that will return 200,000 bbl. of salt water per day to the structure by February 1 and many operators are converting water wells to reinjection wells to return their own water and that of their neighbors. The bonus for this is 1 bbl. of oil for each 50 bbl. of salt water reinjected into the reservoir.

*Texas Railroad Commissioner.

Magnolia Buys Holdings Of Harrison Oil Co.

DALLAS, Tex. — Magnolia Petroleum Co. last week purchased the stock of the Harrison Oil Co. of Houston, Tex., for a reported consideration of $28,000,000. The subsidiary of Socony-Vacuum Oil Co. thus acquired an undivided half interest in approximately 16,200 acres of producing oil leases in Texas and Louisiana.

There are 163 wells involved with a daily production of 13,040 bbl. Largest part of the property acquired by Magnolia is the 12,000 acres of leases in the Old Ocean pool where there are 76 wells with production of 9,760 bbl. daily. Other half interest in the properties is held by J. S. Abercrombie Co., of Houston.

The deal also involved approximately 80,200 acres of unproductive leases in Texas, Louisiana, Alabama, and Mississippi.

Four Standard Oil of Venezuela Executives Are Promoted

NEW YORK.—Four top operating executives of Standard Oil Co. (New Jersey) subsidiaries in Venezuela have been promoted in a general reshuffling of personnel, following resignation of Henry Linam, president.

Arthur T. Proudfit, formerly division manager of Lago operations at Maracaibo, has been made president of the Standard Oil Co. of Venezuela and general manager of Lago Petroleum. Mr. Proudfit joined Huasteca Petroleum Co. at Tampico, Mexico, another Standard of New Jersey subsidiary, in August 1922. He was transferred to Lago in December 1928, to Standard of Argentina as general field superintendent at Manuela Pedraza in February 1936, and then became general superintendent for Standard of Venezuela at Caripito, Venezuela, in September 1938. He was made division manager there in July 1939.

James A. Clark, formerly division manager at Caripito, becomes assistant general manager of Standard and Lago operations. He joined Midwest Refining Co. at Casper, Wyo., in June 1923, and was assigned to Huasteca operations at Tampico in December 1925. Mr. Clark became assistant general superintendent for Lago at Maracaibo in 1926, was promoted to general superintendent there in 1929 and became manager of Lake Maracaibo operations in 1939.

H. A. Grimes was promoted to division manager of Standard of Venezuela Caripito operations to succeed Mr. Clark. He joined the company as assistant district superintendent in Caripito in 1922 and has been in foreign work for the past 20 years.

Allen L. Owens, promoted to division manager of Lago at Maracaibo succeeding Mr. Proudfit, joined the Standard of New Jersey organization in 1918 when he accepted employment with Carter Oil Co., at Tulsa. After spending a year in the Army, he returned to Carter in 1919 and 4 years later transferred to Standard of Venezuela at Maracaibo. He became division manager of Trinidad Oil Fields Operation Co. in 1927 and was returned to Venezuela as general superintendent of Standard operations at Caripito in 1939.

DEATHS

W. W. Keeler, 45, division geologist for Skelly Oil Co., Tulsa, was found dead in his hotel room in Topeka, Kans., a victim of a heart attack suffered some time after retiring Sunday evening. Mr. Keeler came to Tulsa in 1921 as assistant chief geologist with Minnehoma Oil & Gas Co., and was made chief geologist when the head of the department was transferred to California. When Skelly took over the management of the company Mr. Keeler remained as geologist, in 1942 being made division geologist in charge of Kansas, Nebraska, Illinois and Indiana. His widow survives.

John W. Anderson, who was in the oil business in Houston, Tex., for a number of years, died last Saturday, following two sinking spells which attacked him a short time prior to his death. He is survived by his wife, a son and a daughter.

William B. Grimes, 64, Tulsa, who had been undergoing treatment in a Rochester, Minn., hospital, died there last Wednesday. Mr. Grimes had been an oil operator for many years, with properties in Oklahoma, Texas and New Mexico. He was the brother of Charles W. and Otha H. Grimes, who operate the Grimes Gasoline Co., Tulsa. His widow and a daughter survive.

John McMeecham, 71, a stillman for Kendall Refining Co., Bradford, Pa., for over 20 years, died last week at his home in Bradford. His wife and a daughter survive.

George B. Nurss, 78, retired employe of Oil Well Supply Co., and a resident of Oil City, Pa., for more than 50 years, died at his home last week, following an extended illness. His widow, four daughters and four sons survive.

A. H. Arnim, 45, who had been with Humble Oil & Refining Co. for 20 years, and who lived in Houston, Tex., died last Saturday at Fort Worth, Tex. He was formerly with the purchasing department of Humble, and at the time of his death was manager of the specialty-products division.

Joe M. Green, Sr., 55, formerly of Houston, Tex., died last Saturday at his home in Fort Worth, Tex., where he had lived for the past 11 years. He was connected with Gulf Oil Co. His widow, a son and a daughter survive.

William H. Street, 56, of San Antonio, Tex., who was an oil operator in Wichita Falls, West Texas and New Mexico, died January 3 from a heart attack. He was born at Fort Smith, Ark., but had lived in Texas 40 years.

SAE Program on Diesel Fuels Attracts Oil Men

DETROIT, Mich.—The Society of Automotive Engineers is holding its War Engineering Production (annual) meeting at the Book-Cadillac Hotel, here on January 11-15.

The Thursday program includes several papers on aircraft and the following papers on fuels and lubricants.

Thursday, January 14

10 a.m. Fuels and Lubricants
C. H. Baxley, Chairman

The Army Requirements of Fuels and Lubricants—Brig. Gen. Walter B. Pyron, Chairman, War Department Committee on Liquid Fuels and Lubricants.

Influence of Engine Adjustment and Octane Number on Performance of Commercial Engines—D. P. Brenz, H. H. Maxfield and A. B. Culbertson, Shell Oil Co., Inc.

Effect of Altitude on the Knocking Tendency of Engines—D. P. Brooks, National Bureau of Standards.

2 p.m. Fuels and Lubricants
C. M. Larson, Chairman

Corrosion of Bearing Alloys—L. M. Tichvinsky, U. S. Naval Engineering Experiment Station.

Piston Ring Scuffing as a Criterion of Oil Performance—George H. Keller, Wright Aeronautical Corp.

The Influence of Lubricating Oil Viscosity on Cylinder Wear—H. A. Everett, Pennsylvania State College.

Several 100-Octane Units Given Preference

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livered to refinery shops from which maintenance men built up flanges and welding necks from mill-end plate procurable then from warehouses.

In an effort to spread the manufacture and fabrication of refinery equipment to the plants where capacity and facilities are not now fully engaged, the PAW has listed 10 firms either now in position to accept additional orders or whose current contracts will be fulfilled within a few weeks to a point permitting acceptance of new work.

The most recent bulletin on wartime-plant design issued by PAW contains 65 pages and includes specific reports from Gulf Oil Corp., and Shell Oil Co., Inc., on the conservation of critical materials in refinery construction.

Natural Gas

Southern California Gas War Contract Increased

WASHINGTON, D. C.—Defense Plant Corp.'s contract for a war plant to be built and operated by Southern California Gas Co., Los Angeles, Calif., last week was increased to $4,000,000. The increase amounted to $500,000, covering additional facilities which will be incorporated into the war plant.

Natural-Gas Sales Running 10 Per Cent Above Year Ago

NEW YORK.—Sales of natural gas in September 1942 through public utility companies reporting to the American Gas Association, totaled 123,040,800,000 cu. ft., an increase of 6.6 per cent over the same period in 1941. Sales for the first 9 months totaled 1,292,930,900,000 cu. ft., an increase of 10.4 per cent.

Commercial sales of natural gas rose to 6,705,700,000 cu. ft. in September, a gain of 16.7 per cent compared to a year ago. Industrial consumption, showing a more moderate increase in percentage, totaled 72,520,900,000 cu. ft. in September compared with 69,241,600,000 cu. ft. a year ago.

Industrial sales for the year have exceeded 633 billion cugic feet, practically half of the total distribution by utilities.

Lone Star Now Operating Through Two Companies

FORT WORTH, Tex. — Reorganization of the Lone Star Gas Co. so that the five operating companies will be replaced by two became effective January 1. The Lone Star Gas Co. will transmit and distribute natural gas and the Lone Star Producing Co. will handle production operations. These two companies replace the Dallas Gas Co., Lone Star Gas Co., Community Natural Gas Co., Texas Cities Gas Co. and the Lone Star Gasoline Co. The former holding company, Lone Star Gas Corp., expires.

For the past 30 years, Lone Star Gas Co. has been a wholesale pipeline concern having local distribution only in Fort Worth, but through the subsidiaries served 295 Texas and southern Oklahoma towns. The company's properties in El Paso and Galveston, Tex., will be sold under the reorganization plan.

OPA Allows Higher Prices By Changing Basing Date

WASHINGTON, D. C.—The cost of increasing natural-gas production through expanded drilling programs and operation facilities was recognized last week by the Office of Price Administration which changed the base date for determining maximum-gas prices from October 1941 to May 1, 1942.

Establishing maximum prices at the May 1 level will permit, in some instances, higher field prices to gas producers but will not affect consumer markets, OPA stated. The adjustment in the base-price date was necessary to relieve those producers who, between October 1941 and May 1942, entered into contracts involving drilling and expansion of operations. The change of date will substantially eliminate production obstacles.

Price increases occasioned by the new base date will vary as between producing areas, facilities and methods of operations, notably in the Appalachian region and California, OPA stated. In some important sections such as the Mid-Continent, where no substantial price increases occurred between October 1 and April 28, 1942, prices will not be materially changed.

The change is contained in Amendment 51 to Revised Price Schedule 88—Petroleum and Petroleum Products—and is effective January 2.

The amendment ties dry gas contracts and maximum prices to the source of supply and provides three criteria under which dry gas producers may determine maximum prices:

1. Where contract for sale was in effect May 1, 1942, maximum prices for sales under the contract, renewals or new contracts shall not exceed the price which could have been charged under the terms of the con- a contract in effect on May 1, 1942, but not contract with a particular tract in effect as of that date.

2. Where a seller of dry gas had purchaser, subsequently executed contracts with purchasers shall not exceed in price the levels possible as of May 1.

3. Where no contract existed on May 1, 1942, seller's prices in contracts made effective after that date shall not exceed in price those in effect May 1, 1942, by the seller's closest competitor selling to the same class of purchasers.

Power Assigned to Cut Off Natural-Gas Consumers

WASHINGTON, D. C.—Consumers of natural or manufactured gas may be cut off from their gas supply if they have standby equipment to convert such facilities to operate on alternate fuels.

This is provided for in amendments just issued to Limitation Order L-31 (natural and mixed gas) and L-174 (manufactured gas). As a practical matter, the amendments will apply chiefly to industrial plants.

The amendments provide that the Director General for Operations of WPB may prohibit the delivery of gas to a consumer who has standby (auxiliary) equipment but who fails to obtain an adequate supply of fuel to operate such equipment despite the availability of such fuel.

Another provision of the amendments provides that the Director General for Operations may prohibit further delivery of gas to a consumer who can, without unreasonable expense or hardship, convert his equipment to use a less critical fuel, yet fails to do so, provided such conversion would help alleviate an actual or prospective gas shortage or maintain gas delivery to war producers or essential civilian services. This is a preliminary step in the development of a program of conversion from critical to less critical fuel.

Panhandle Eastern Approves Phillips Sale

Stockholders of the Columbia Oil & Gasoline Corp. last week approved the sale to Phillips Petroleum Co. of the company's holding in the Panhandle-Eastern Pipe Line Co. They also approved dissolution of the company by the necessary two-thirds majority.

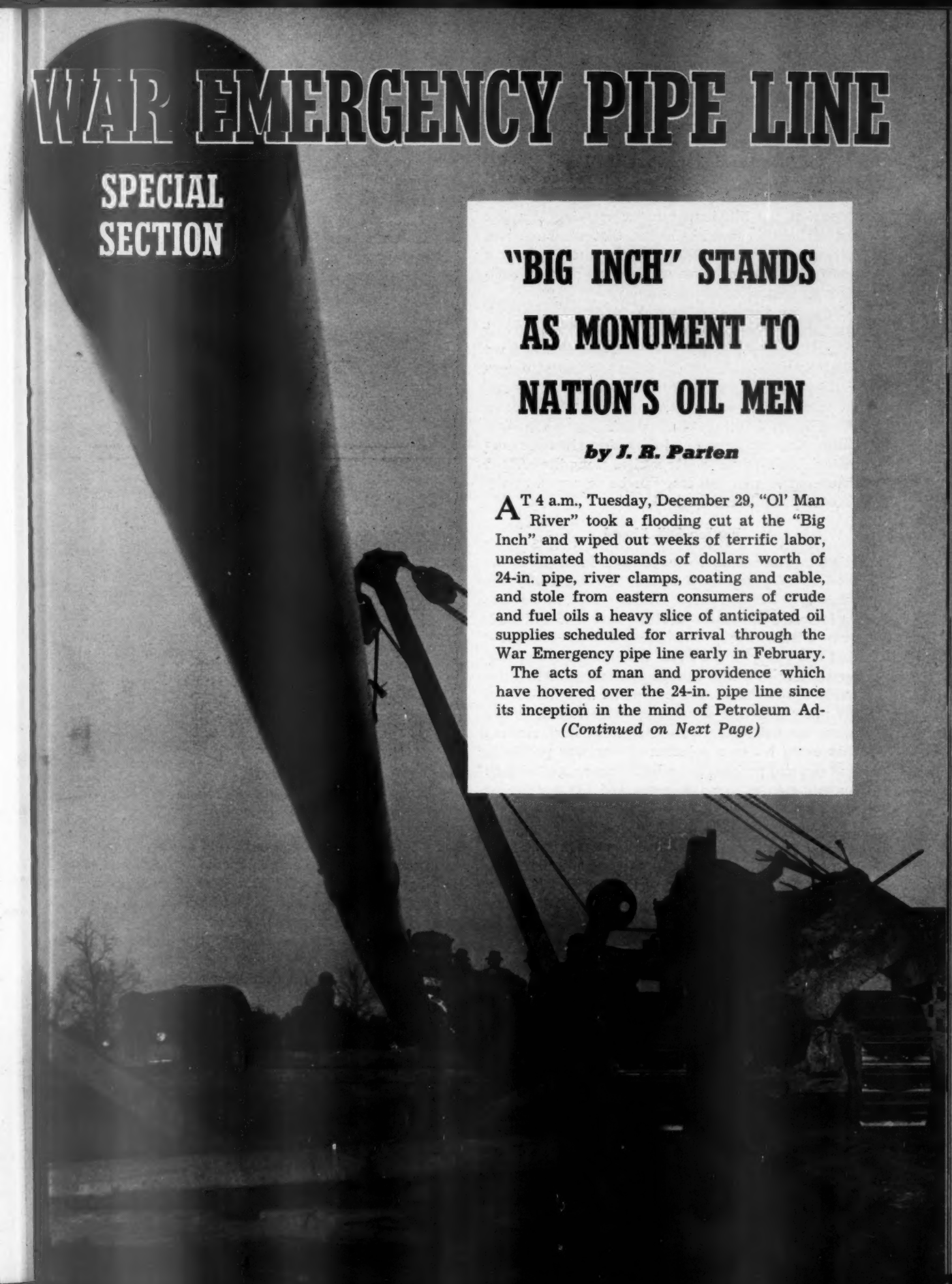
Continental Expanding Capacity at Lusk, Wyo.

DENVER, Colo.—Continental Oil Co., Ponca City, Okla., is expanding its natural gasoline plant at Lusk, Wyo., at a cost of more than $500,000, to supply increased demands for light hydrocarbon products.

Most of the plant's increased production, W. H. Ferguson, Denver, executive vice president, said, would go to a 100-octane gasoline plant operated by Utah Oil Refining Co. at Salt Lake City, Utah.

WAR EMERGENCY PIPE LINE

SPECIAL SECTION



"BIG INCH" STANDS AS MONUMENT TO NATION'S OIL MEN

by J. R. Parten

AT 4 a.m., Tuesday, December 29, "Ol' Man River" took a flooding cut at the "Big Inch" and wiped out weeks of terrific labor, unestimated thousands of dollars worth of 24-in. pipe, river clamps, coating and cable, and stole from eastern consumers of crude and fuel oils a heavy slice of anticipated oil supplies scheduled for arrival through the War Emergency pipe line early in February.

The acts of man and providence which have hovered over the 24-in. pipe line since its inception in the mind of Petroleum Ad-

(Continued on Next Page)

(Continued from Previous Page)
ministrator Ickes have been fearful and wonderful —sometimes helpful, never certain—and the catastrophe at the Mississippi River crossing tops the list of hazards and headaches that we have had to overcome in the effort to make the Big Inch a reality in terms of more oil for the critically deficient eastern areas of the country.

Now, we think, we must have experienced the ultimate in impediments to final completion of the Texas-Illinois leg of the pipe line, and although we must postpone our anticipations for initial operation by some 3 weeks, Burt Hull, Maj. Al Horne, all their highly capable lieutenants in WEP and the Williams Brothers river crossing crew are highballing the repair job and diverting river-crossing materials already en route to sites along the eastern extension so that the loss can be recouped at the earliest possible moment.

Big Job Still Ahead

We face the comprehensive tasks involved in the total PAW pipe-line program, and especially the 6-month job of completing the Big Inch through to its logical destinations at New York and Philadelphia, a little bloody but hardly bowed. The spirit that has punched the 24-in. through delays of materials and over the humps of natural difficulties will, I am confident, see the big line, as well as all the other pipe-line adjustments undertaken to improve the petroleum situation in the East. Adding that extra bit to a solution of our war problems that can and perhaps must be the margin of victory for our men at arms overseas and for our racing war plants throughout the East.

Let no reader think that I've gone flabby upstairs when I resort to that word "spirit." I know what extras of human effort and patience and drudgery have gone into the making of the Big Inch. I know that more than facts alone finally punched Petroleum Administrator Ickes' idea of a Texas-East Coast pipe line through to the blueprint and finally the construction stage. I know that it has been more than superb engineering, and superior pipe-lining craftsmanship that has brought the War Emergency pipe line almost to functioning reality. In short, I know Burt Hull and Al Horne, Oscar Burden and Oscar Wolfe and their lieutenants in WEP. I know many of the men who have been responsible for the actual work of laying the 24-in. line up from East Texas to Illinois, and I know what helpful cooperation has been given by our associates in the Defense Plants Corp. and what towering labors have so obscurely but so effectively been done by one of the biggest spirits behind the Big Inch, W. Alton Jones, president of WEP.

No story of the War Emergency pipe line is an adequate document of this great job without full reference to these men and their accomplishments.

J. R. PARTEN
Director, Transportation Division
Petroleum Administration for War

Petroleum Administrator Harold L. Ickes has already cited those accomplishments as a "record of teamwork unsurpassed." That statement sums up the essence of war service and consciousness of duty that has characterized every phase of the petroleum industry's work with the Government during the first year of global war. It applies with especial emphasis to the industry's contribution in the field of petroleum transportation. And in the final catalog of things that broke the back of Schickelgruber's hordes and Hirohito's henchmen, the Big Inch will stand high—stand high on two counts as a carrier of the oil that is victory ammunition, and as a monument to the men of America's oil business.

WEP LINE

Industry's Largest

NOW that oil has been moved into part of the Longview, Tex.-Norris City, Ill., leg of War Emergency Pipelines, Inc., project for moving 300,000 bbl. daily eastward, a gigantic transportation system is definitely materializing. Obstacles predicted by many in the industry have been overcome and the functioning of this system is now fully assured. The largest part of the project has been completed ahead of schedule.

The 731-mile leg of 24-in. is being followed up with 857 miles of line to the East Coast. The entire length of the main line and extension branches will be 1,380 miles. From Norris City, Ill., to Phoenixville Junction, Pa., a distance of 720 miles, 24-in. pipe will be used. From Phoenixville Junction, there will be a 92-mile stretch of 20-in. pipe to Bayway, N. J., and a 45-mile stretch of 20-in. to Philadelphia. This artery is the largest oil-carrying pipe line ever constructed. Cost of the entire project is estimated at $95,000,000.

Stations and Terminals

There will be 25 standard pumping stations on the main line, each equipped with three 1,500-hp. electric motors driving three single-stage centrifugal pumps in series and there will be an additional pumping station of the same type on the 20-in. line between Phoenixville Junction and Bayway.

After the first section has been completed, petroleum will be moving from Norris City to eastern refineries in railroad tank cars which have been making the long haul from oil fields and refineries of the Mid-Continent and Southwest to the East Coast. New railroad trackage at Norris City will provide for loading 300 tank cars at one time. On completion of the project to the East Coast, 300,000-bbl. capacity of the system will be equivalent to the average daily delivery capacity of 25,000 to 30,000 railroad tank cars. In recent months, an average of approximately 775,000 bbl. per day has been the record of deliveries to the East Coast by railroad tank cars. When the recently completed leg to Norris City is operating at capacity it will increase deliveries to the East Coast by about 125,000 bbl. daily as a result of shortening the railroad haul.

Organization

The project is owned 100 per cent by Defense Plant Corp., a subsidiary of RFC, of which Samuel H. Husbands is president. War Emergency Pipelines, Inc., has agreed to act for DPC without profit to itself or its stockholders. War Emergency Pipelines, Inc., is a corporation organized by 11 oil companies doing more than 85 per cent of the oil business in the East Coast area. It was formed primarily to build and operate emergency oil pipe lines; the organization is headed by W. Alton Jones, president of Cities Service Oil Co. Operations at Little Rock, Ark., headquarters are directed by B. E. Hull, president, Texas Pipe Line Co., who is vice president and general manager of WEP, and A. N. Horne, general manager of Empire Pipeline Co., who is vice president and assistant general manager of WEP.

Before the completion of the main line of the 24-in. crude pipe line to the East Coast by the middle of June 1943, it is believed that definite steps will have been taken toward the construction of a 20-in. line from the Houston and Beaumont-Port Arthur refining areas which will extend northward to a point on the WEP 24-in. line near Bald Knob, Ark.; from there on eastward, it will probably parallel the crude-oil line. Pumping stations can be enlarged to serve both systems and operation and maintenance can be handled by the same personnel. The 20-in. products line, with a capacity of 235,000 bbl. added to the 300,000-bbl. capacity of the WEP 24-in. line, will give a total of 535,000 bbl. moving overland to the East Coast.

Because of the extremely low cost, due to the reduced investment and operating expense per barrel, there is no question of the ability of these big lines to compete with tankers under peacetime conditions. Competition with tankers is discussed in more detail elsewhere in this section.

Future of System

To start the 20-in. products line before the 24-in. crude-oil line is completed will raise a number of serious problems. Once the construction of the 20-in. line is under way, good progress should be expected because of the increase in efficiency of the construction organizations which by then will be entirely familiar with the sections in which they would be working.

Defense Plant Corp., the owner of the system, looks forward to disposing of it when peace comes and the period of emergency is over. It is believed the oil industry will have the first refusal of the line.

It will probably be early in February before the first shipments can be loaded into tank cars at Norris City.

Fluid, whether crude oil or heating

oil, will flow through the line at 725 to 740-lb. pressure at a rate of about 6.6 ft. per second or 4.5 m.p.h.; it will take about 5 days for shipments from Longview to reach Norris City. This is about the same rate as average pipe-line travel. It will take 14 days for the oil to reach Bayway from Texas with the line working at full capacity. Only waterworks employ pipe lines of such large diameter for moving fluid.

The first step in putting the line into operation is filling it with 1,600,000 bbl. as far as Norris City. It has been anticipated that the line would be tested by 50 to 100 miles of water pumped ahead of the oil. When the fluid reaches a station, a gate will be closed while a pressure of from 900 to 1,000 lb. is built up for testing purposes. Bleeders have been installed at different points along the line for venting air. More than 4,000,000 bbl. will be required to fill the line to the East Coast.

At Norris City, WEP is completing construction of three loading racks, each of which is 2,000 ft. long, capable of loading 300 cars. The program calls for three "spots" per day. One of the railroads taking tank cars out of Norris City handles them in trains of 100 cars each. The other railroad handles them in trains of 60 cars each. Facilities provide for loading crude oil and heating oil in tank cars at the same time from loading racks.

The feeder system at Longview will consist of about 50 miles of pipe of various sizes. One set of lines reaching the terminal as a 24-in. line will bring crude oil from the Humble, Sinclair, Pure, Atlantic, Gulf and Texas-Empire-Tidal systems. The heating-oil system reaching the station with a 16-in. pipe will deliver from the systems of Pan American, Shell and Sun-Stanolind which are to be reversed to move this refined product from Gulf Coast refineries.

Relation to War

In relation to the national welfare under wartime conditions, a huge project such as the WEP system must be thought of in terms of steel tonnage required before the money expense. Before the project was started it is estimated that steel tonnage sunk in tankers attacked by submarines amounted to more than all of the steel required for building the 24-in. crude-oil line from Longview to the East Coast and the 20-in. products line from the Gulf Coast to the East Coast, together.

Although the WEP system is intended primarily to supply the urgent needs in District 1, the mounting demands of the Army, Navy and our Allies will become more insistent in dictating the utilization of this facility. This line will greatly shorten the course to North Africa; in fact, it has been estimated that a saving of 85 tankers will be effected by the use of New York instead out of Gulf Coast ports in this service.

In acquiring right-of-way, WEP has not invoked the authority provided by the Cole Right-of-Way Act. Where condemnation proceedings were necessary, they were conducted under the authority of the Second War Powers Act which authorizes the president of the United States to acquire what is needed for carrying on the war.

One incident illustrates the attitude of many people along the route of the line who do not comprehend the significance of the project. When a right-of-way buyer approached one farmer he said that, instead of selling him the right-of-way outright, he preferred to take a royalty of ¼ cent per barrel on the oil passing through the WEP line across his land. He did not realize that this would make him rich in a hurry. In less than 5 months by such a scheme he would become a millionaire.

Batch Shipments

The greatest difficulties in constructing the WEP system have not been those presented by physical features along the route but by red tape of various kinds. It has taken 3 weeks to a month to get full clearance on some of the simplest types of items. Numerous small details prevented the full completion of the program at an earlier date. It is believed that much of the trouble with red tape is due to a system set up by individuals who expected it to work perfectly.

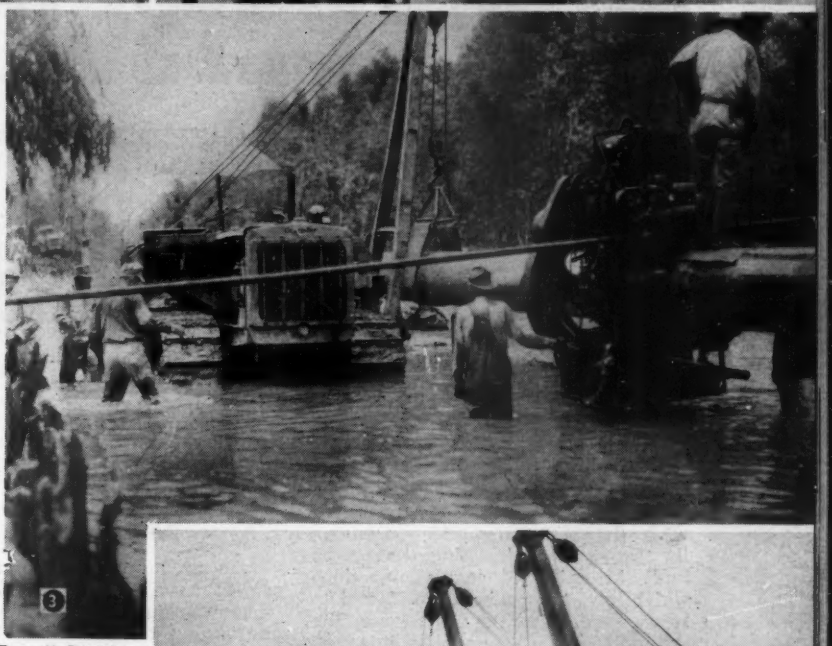
Shipments will be moved through the line in batches of 500,000 bbl. each. It is doubtful whether larger batches would be practicable because of the limited tankage at the terminals. The present program calls for handling shipments which will average, over a period of time, 130,000 bbl. of heating oil and 170,000 bbl. of crude oil.

To reduce contamination between batches to a minimum, studies will have to be made of the optimum rate and pressure for moving batches. This determination will probably be made empirically. A rubber pig or plug will be placed between batches of crude and heating oil. The plug has a tendency to lag somewhat and a certain amount of the batch behind it precedes the plug. It may become desirable to take samples from the main line at intermediate pumping stations to definitely locate the position of batches in order to estimate the time of their arrival at Norris City.

The traffic problem confronting the line will be frequently puzzling because of fluctuations in supply and demand. This will mean considerable variations in movements of heating oil and crude oil eastward. To fully utilize the capacity of the line will take much careful planning.

Map showing Texas-Illinois leg of WEP now being completed and route of extension to East Coast, as well as route discussed for a 20-in. Gulf Coast-East Coast products line

The Barrett Division

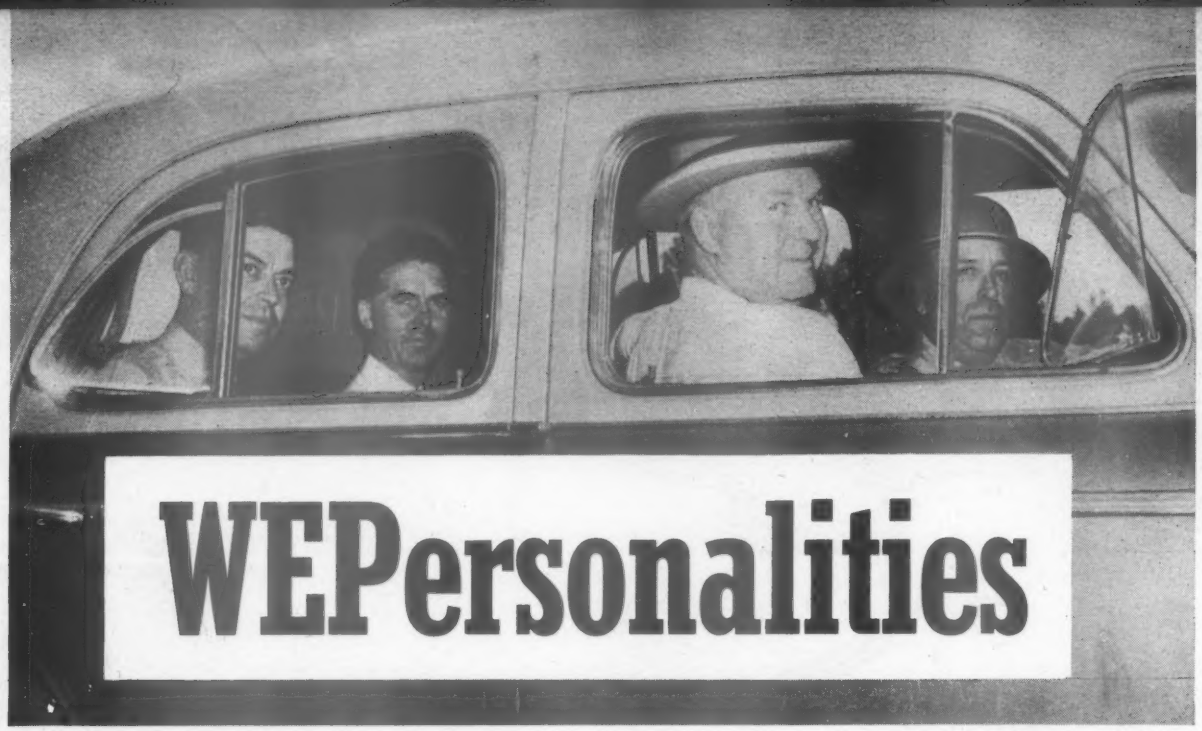


Barrett Division

WEP 24-INCH CONSTRUCTION

The Barrett Division

(1) Cooling pipe after fire bend. (2) Pipe gang employing stove-pipe method. (3) At a river crossing pipe is washed and dried ahead of operations. (4) Application of coal-tar enamel and asbestos felt. (5) Clam shell mucking ditch to prepare for lowering. (6) Inside of pipe was cleaned by "human swab" sliding through the pipe on a dolly rack



WEPersonalities

Officials on inspection tour of the 24-in. line: Samuel H. Husbands, president, Defense Plant Corp.; Ralph K. Davies, Deputy Petroleum Administrator for War; W. Alton Jones, president, and B. E. Hull, vice president and general manager, War Emergency Pipelines, Inc.

THE building of the War Emergency Pipelines, Inc., line is a splendid example of what can be accomplished when executives of major pipe-line companies undertake to aid the federal Government in meeting a national emergency. All men in the industry who are familiar with facts give much credit to Harold L. Ickes, Ralph K. Davies and J. R. Parten, for what they have done in sponsoring the project and insisting that it be built in spite of many objections which have been raised. To Harold L. Ickes especially, they attribute the original demand for such a line.

In carrying on construction, the pipe-line executives in charge of the work have applied constant vigilance and resourcefulness so that the line could be completed so as to begin to function early in 1943. According to them, this could not have been done had it not been for the wholehearted cooperation on the part of the contractors engaged in various phases of the work.

To complete nearly all of the work about a month ahead of schedule meant that push and efficiency was applied to this gigantic project which is characteristic of the undertaking of the oil industry. As would be expected, work was delayed in much the same way as it would be on other pipe-line construction jobs, due to trouble occurring at different times with each step in the operations. Probably the greatest delays came in lowering in during wet weather. Planning ahead to anticipate possible future trouble contributed much to the speed of successful construction organizations in laying pipe. Since the project has been built on a cost-plus basis, it has been necessary for the management to give closer supervision of many details with which it would not be concerned if the work had been contracted in the usual way. By doing so, the quality of work has been maintained, waste of money avoided and a steady rate of progress assured.

PAW Aids WEP

A large number of details of the project have been handled through what was formerly known as OPC and is now designated as PAW. That office in Washington has carried the ball in getting the necessary priorities. WEP has not employed expeditors such as are frequently used by other government projects. Much has been done for the progress of WEP by R. B. McLaughlin and W. C. Kinsolving in their terms of service with OPC and PAW.

W. Alton Jones, president of War Emergency Pipelines, Inc., has had an active part in the development of plans, now being consummated in the construction of this great transportation system which appeared to be impossible to build less than a year ago. He is concerned with direction of policies vitally affecting the project which require much attention in New York and Washington.

Burt E. Hull, president of Texas Pipe Line Co. and vice president and general manager of WEP, has been required to spend a large part of his time in conference in New York and Washington. In spite of this, he has maintained constant supervision of the entire project, and everyone knows he is working for a man who insists on removing obstacles to the progress of the undertaking.

A. N. Horne was released from the Army where he held a commission as major, concerned with transportation problems in the War College at Washington. Before his military service, he was manager of Empire Pipe Line Co. During most of the building of the Texas-Illinois leg, he has been acting as assistant to the manager, while holding a position of general superintendent. He now has the titles of vice president and assistant general manager.

Directors of War Emergency Pipelines, Inc., who are not officers are: John A. Brown, president, Socony-Vacuum Oil Co., Inc.; Robert H. Colley, president, Atlantic Refining Co.;

(Continued on Page 89)

MEN BUILD PIPE LINES

A project of the magnitude of the War Emergency Pipelines, Inc., 24-in. system does not build itself. Only by the steady driving effort of executives, who know how to get full results from pipe-line organizations and equipment, has this vital artery been constructed within a few months.

Circle: B. E. Hull, vice president and general manager, WEP; president, The Texas Pipe Line Co.

Top left: Oscar Wolfe, chief engineer, WEP; formerly chief engineer, The Texas Co., production department

Top center: Maj. A. N. Horne, vice president and assistant manager, WEP; general manager, Empire Pipeline Co.
Top right: Oscar R. Burden, general superintendent, WEP

Lower left: Brady Cole, associate general counsel, WEP; member of firm of Brady, Botts, Andrews & Wharton

Lower right: Charles I. Thompson, vice president and general counsel, WEP

1. FIRST TRAINLOAD of 24-inch seamless steel pipe left a plant of National Tube Company July 10, 1942. This represented approximately one day's production for this line, as per schedule. The whole 550 miles of pipe was completed on November 10, 1942—an average of a trainload a day.

2. STRINGING Pipe for all seven crews was delivered to the right places, at the right time. Work marched along at a fast rate without hold-ups because there was no lack of pipe.

Pipe for First Unit "Big-inch" line completed

On time!

"BIG INCH", pipeliner's name for the new War Emergency Pipe Line, runs from Longview, Texas north for 550 miles past peaceful cabins, through dense woods, under railroads and rivers on to Norris City, Illinois. From there it will be extended to Philadelphia and New York. This is the world's largest capacity oil line.

UNITED STATES STEEL

3. BENDING Both the hot and cold methods of bending the 24-inch pipe proved successful. In each instance a tractor holds a bending block firmly at the point where the bend is desired and a second tractor pulls the end of the pipe to obtain the correct curvature.

4. TACK WELDING another joint in the line. Records were made for laying 24-inch pipe; as many as 8 miles were laid by the contractors on certain days.

550 miles of 24-inch seamless pipe for first unit finished exactly on schedule

DRIVING across the middle west at record-breaking speed to complete the first unit of the world's biggest oil line, pipe line crews can be justly proud of a remarkable accomplishment. Texas oil will soon be flowing into Norris City, Illinois at an expected rate of 300,000 barrels a day.

This means that tank-cars can now move east from this point, instead of Texas, and save 550 miles haulage. The railroads will be able to deliver approximately 50% more oil in a given period of time. When the entire line is completed to New York and Philadelphia, it will deliver as much oil as would be handled by a fleet of 150 tankers of 10,000 deadweight tons each in Gulf Coast to East Coast movement under existing conditions.

Fortunately, NATIONAL Tube Company had foreseen, some years ago, need for 24-inch seamless steel pipe. When the emergency came, our mills were ready—the only ones in America big enough and fast enough to handle the job. Pipe flowed from our plants at the rate of a trainload a day. Four months after the mills started to roll, every foot of the 550 miles of pipe had been finished.

But it takes more than big machines to maintain such production speed. It takes sweat, loyalty, and fighting spirit of men. From the blast furnace crews to the piercing mill gangs . . . from the testing machines to the shipping department, every man was determined to make the schedule—and they did!

But this is not all. Pipe for the second unit of the line is now being manufactured. Our mills never stopped rolling between completion of pipe for the first unit and the start of production for the second.

Here is the biggest pipe line job ever tackled—and it is being rushed to completion in a typical American way. Skill, facilities and determination of every ditch digger, welder, pipe maker and engineer are coordinated in one grand effort to complete the whole project on time.

NATIONAL TUBE COMPANY

PITTSBURGH, PA.

United States Steel Export Company, New York

5. READY FOR COATING AND DITCHING with all bending and welding completed. Experience in the field showed that even such large pipe was well suited to customary construction procedures.

6. RIVER CROSSINGS were generally made by tractors pulling pipe into the river as each joint was welded on. Line was floated until ready to lower. Dredges then sucked sand from beneath the pipe and allowed it to settle 4 to 5 feet below the river's bed.

NATIONAL SEAMLESS

Pipe Line Will Compete With Ocean Tankers

by Paul Reed

THE WEP system is a vital emergency measure which would be needed even if it cost 10 times what it will to build and 10 times as much as what it will actually cost to operate. Only through the pipe line can a marked increase be made in shipments of oil to the East Coast. Not only is the WEP one of the outstanding war projects because of its size, but it is unique in being a facility built under wartime conditions which will function with lower operating costs and lower investment costs per unit handled than other facilities in its field.

The line will not only compete with tankers by operating at a lower cost but will mean that future tanker programs will have to be built around the WEP 24-in. crude-oil line and the prospective 20-in. products lines as the basic low-cost facilities.

So efficient will the WEP system be in petroleum-transportation service that there will be no reason for considering that it must be turned into a natural-gas line eventually in order to salvage the investment.

By making certain assumptions which might occur to anyone speculating on the subject, it is apparent that the cost of transportation through the WEP 24-in. line would be below that by tankers from the Gulf Coast to the East Coast. Proceeding in the customary manner for estimating transportation costs for a line equipped with electric centrifugal pumps, certain definite conclusions may be reached.

To start with, operating pressure of 725 lb. per sq. in. is known to be contemplated since it has been mentioned in announcements regarding the line; energy input for the 26 stations on the line between Longview, Tex., and Bayway, N. J., can be estimated. With electric motors of 95 per cent efficiency driving centrifugal pumps of 85 per cent efficiency, it appears that 777,000,000 kw.-hr. per year will be required for moving 300,000 bbl. daily through 1,388 miles of pipe; this includes 24-in. pipe as far as Phoenixville, Pa., and 20-in. beyond. At an assumed cost of 8 mills per kw.-hr., which is reasonable for such a project, the power cost of moving 1 bbl. the entire length of the line would be $0.057. Labor expense for operation and maintenance for a staff of employes, averaging $250 a month, would amount to about 10 per cent of the power cost or ½ cent per barrel. By adding other charges and expenses a total of 13 cents per barrel is obtained as the Texas-New York transportation cost when operating at 100 per cent load factor. Of course the per barrel cost would rise considerably if the load factor should drop to any extent.

The cost of transporting a barrel of oil through the 24-in. crude-oil line from Longview, Tex., to the New York area may be arrived at in the following manner:

Electric input per station per year

$$= \frac{725 \times 12{,}500 \times 0.746 \times 8{,}760}{2{,}450 \times 0.85 \times 0.95} =$$

29,900,000 kw.-hr. per station per year.

For 26 stations = .29,900,000 × 26 = 777,000,000 kw.-hr. per year for 26 stations.

Power cost per year = 777,000,000 × 0.008 = $6,220,000.

Power cost per barrel transported from Texas to New York area =

$$\frac{\$6{,}220{,}000}{300{,}000 \times 365} = \$0.057 \text{ per bbl.}$$

Assume investment = $95,000,000.

Depreciation 5 per cent	$4,750,000
Taxes and insurance 2 per cent	1,900,000
Power	6,220,000
Operating personnel	900,000
Maintenance and supplies	250,000
Miscellaneous expense	280,000
Total expense per year	$14,300,000

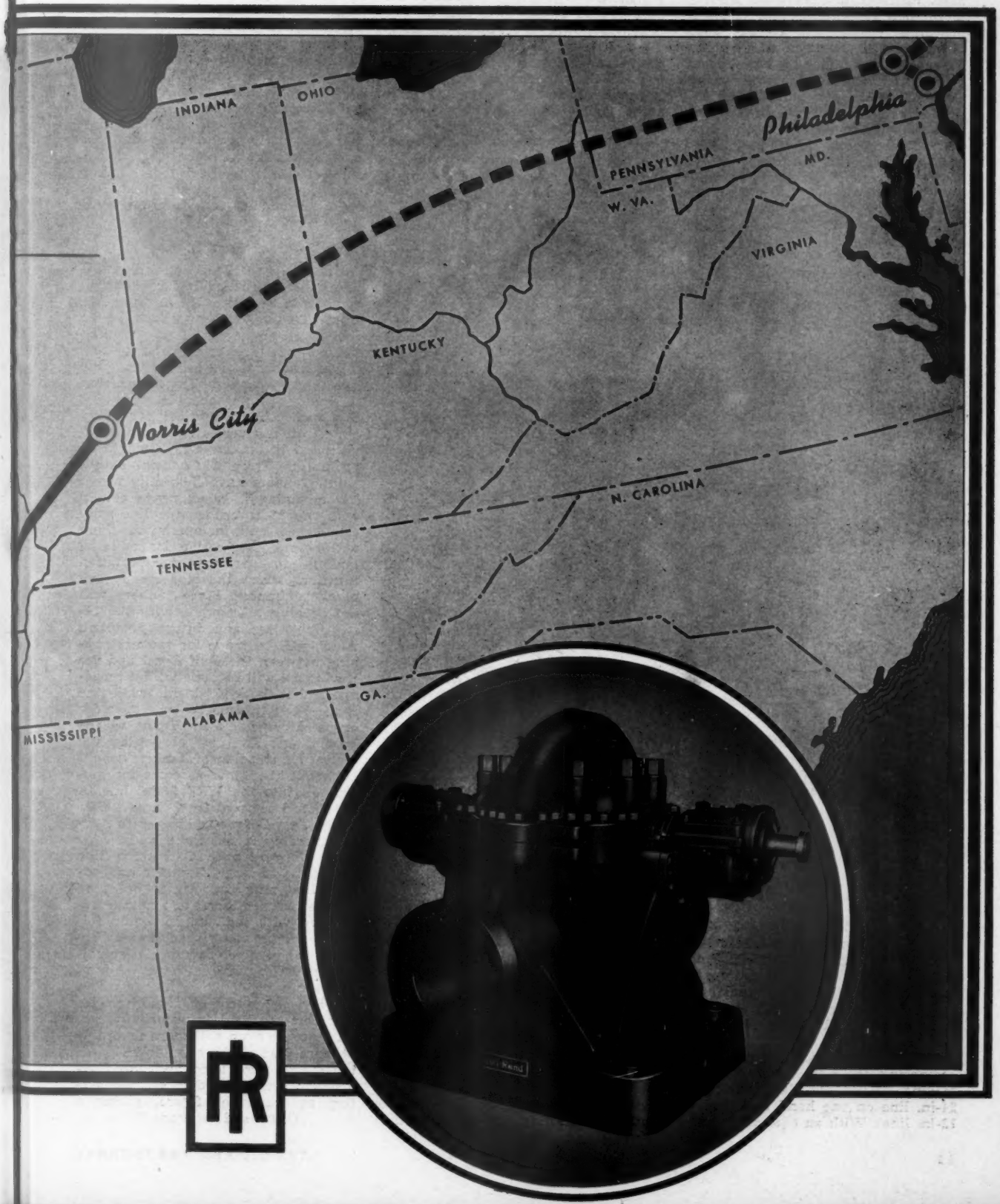
Total cost per barrel (all charges)

$$\frac{14{,}300{,}000}{300{,}000 \times 365} = \$0.13 \text{ per barrel at 100 per cent operation of the system.}$$

These calculations lead to the conclusion that the total cost of moving

The entire Texas-Illinois leg is protected by coating and wrapping

EAST !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VIRGINIA
KENTUCKY
Norris City
N. CAROLINA
TENNESSEE
GA.
MISSISSIPPI
ALABAMA

oil through the 24-in. line will be about 13 cents per barrel at 100 per cent load factor. At 90 per cent load factor, the cost may be 15 cents per barrel. From various sources it is reported that the shipping of oil from the Gulf Coast to New York by the most efficient tankers costs slightly more than 16 cents per barrel under peacetime conditions; average costs of moving oil between these points in a tanker fleet, including tankers of different kinds, is reported to be about 22 cents per barrel. Railroad freight rates for shipments by tank car from East Texas to the New York-Philadelphia area are about $1.70 per barrel.

The tonnage of steel required for the 24-in. line is much less than the tonnage needed for building 25,000 to 30,000 tank cars which might deliver 300,000 bbl. per day between Texas and the East Coast. Furthermore, the manpower for building tank cars would be harder to obtain than the manpower for building the 24-in. line.

Line on skids ahead of lowering-in gang. In the foreground is Paul Reed of the Journal staff on one of his trips along construction operations of the WEP line

Striking conclusions are reached in comparing the power necessary for moving 300,000 bbl. daily through a 24-in. line on one hand and through 12-in. lines. With an equivalent number of 12-in. lines giving the same capacity as 24-in. pipe at the same pressure drop, the friction coefficient would be 25 to 30 per cent greater and consequently the power input would be increased proportionately. The relation of skin friction to the volume handled is so much less in the case of the larger pipe that 30 per cent less power is required for moving a barrel of oil through 24-in. pipe than through 12-in. lines moving 300,000 bbl. daily under the same conditions. This is another indication of the great competitive advantage which the 24-in. line has over the 12-in. lines which have been standard large-diameter crude lines used by the oil industry. Of course it is necessary to keep in mind that only in an exceptional situation, such as the WEP project serves, would 24-in. lines be practicable.

The low cost of operating the WEP system compares favorably with that of good crude-oil trunk-line experience where a cost of $0.0003 per bbl.-mile is considered to be fairly low. Transportation through the 24-in. line will cost about $0.0001 according to the figures arrived at in studying assumptions previously made in this article regarding costs. In other words, it will cost about one-third as much to move a barrel of oil through the 24-in. line as it would to move it through a good standard 12-in. trunk line.

Before the building of the WEP line, there was no correct basis for comparing pipe-line transportation with tanker transportation because there was no pipe lines in existence designed to compete with tankers. With the exception of the WEP system, lines connecting the Gulf Coast with the East Coast have been a patch-work of systems some of them dating from the early 1900's; they were originally intended for the most part, primarily to serve western refineries. Linking them together for Gulf Coast-East Coast shipments has been a secondary consideration, coming with war conditions.

Peacetime Status

Under peacetime conditions, it would be impracticable for major oil companies to build a 24-in. pipe line from Texas to New York, even though it might be clearly demonstrated that the per barrel transportation cost would be less by this pipe line than by tankers. The reason that it would be impracticable would be that such a line would call for heavy amortization charges against the investment in tankers which would be prohibitive from a financial standpoint. Tankers have flexibility which has advantages. When peace comes, with the 24-in. crude pipe line fully established and in operation, there will be no justification for building tankers to perform transportation functions which the pipe line is prepared to handle. Since tankers will not be able to compete with the 24-in. pipe line, any future provision which will be made for tankers running between the Gulf Coast and the East Coast will be done with a recognition that the WEP 24-in. trunk line is the basic transportation system for crude shipments from Texas to the East Coast. The cost of getting the oil to the shipside of tankers would be about the same as costs for getting oil into the WEP 24-in. line. A products line from Gulf Coast points to the East Coast would operate fully as favorably if not more so.

To compete with tankers, a line should be of large diameter and operated at near capacity in order to reduce cost per barrel to a point competitive with tankers. It should follow a shorter route than tankers because the cost per barrel-mile actually traveled by tankers is very low in peacetime.

When peace comes conditions for low cost of WEP transportation are likely to be even still more favorable because part of the cost of WEP will have been amortized and the Government could afford to sell the system at a reduced figure, giving a

(Continued on Page 77)

Electric Installations

*by W. H. Stueve**

A GREAT amount of interest has been evidenced in the electrical features of the largest-diameter pipe line ever constructed to transport petroleum and petroleum products now being installed from the Mid-Continent oil fields to eastern tidewater.

Electric power, purchased from existing utilities, was selected to provide the pumping energy, for the reason that the large capacity of the pipe line made it practically imperative that centrifugal pumps be used for the capacity of 300,000 bbl. per day. This amount of oil, when compared to volumes of water, is about one-half of the total water consumed daily by cities like Tulsa and Oklahoma City. Steam-turbine drive would have required more critical materials than the motors and condensing water required at each pump station would have been too great a problem to consider steam drive. If diesel engines had been considered they would have required more critical materials than motors and the speed-increasing gears necessary could not readily be secured. After giving consideration to all these factors and after weighing carefully the operating flexibility of electric motors—the lesser maintenance, the lesser operating labor required and lower first cost of the electric motor pump stations—the electric induction motor was selected, with the hope that the power supply could be arranged for at an equitable figure. All the power companies, in whose service territory the pumping stations are located, have cooperated to the greatest degree and the contracts temporarily negotiated have fully justified this decision.

Station Equipment

There will be twenty-five 4,500-hp. pump stations installed between the origin and terminal of the 24-in. line at Phoenixville, Pa., spaced about 52 miles apart in the comparatively level portions of the line, with working initial pressures at each station of the order of 700 to 750 lb. per sq. in. On the western slope of the Appalachian mountains south of Pittsburgh, Pa., the pump stations are spaced somewhat closer together due to the uphill static head; whereas, on the downhill eastern slope of the mountains in Pennsylvania, the stations are spaced at a greater distance than average.

*Electrical Engineer, War Emergency Pipelines, Inc.

The electric equipment in each pump station consists in the main of three 1,500-hp., 2,300-volt, 1,787-r.p.m., four-pole induction-type motors each direct connected to a full-capacity, single-stage, centrifugal pump capable of exerting about 250 lb. per sq. in.

Three of these pumps, when connected in series, will deliver full (100 per cent) line capacity; whereas, two of the pumps in series will deliver about 83 per cent of line capacity, and one pump will deliver about 55 per cent of full line capacity. The motor-starting equipment is housed in steel compartments with only the manual or emergency operating handles protruding through the face of the steel panel. The electric wiring and bus conductors are all housed in behind the steel compartments. Electric power is delivered to the pipeline-company substation on the pump-station site at their primary voltage, 110,000, 66,000, 33,000 or 22,000. This primary voltage is then stepped down to 2,300 volts through a three-phase (single unit), 3,750-kva. transformer located about 30 ft. from the pump-station building. The 2,300-volt power is metered outdoors in the substation and then passed overhead through three 1,250,000 c. m. bare copper cables to the main oil circuit breaker of 1,200-amp. capacity located in steel compartments inside the motor room of the pump-station building. Each of the three motors are protected by 600-amp. oil circuit breakers, and all the oil circuit breakers have interrupting capacities of 100,000 kva. to meet the power companies' requirements.

The motor-starting equipment is either of the full-voltage (FV) "across the line" type or "reduced voltage" type (RV), depending on the power-supply requirements.

In the stations where the across-the-line starting equipment is used, the momentary power inrush may approach 500 per cent of full load running current in amperes; whereas, in the stations having installed reduced-voltage starting equipment the inrush current in amperes is only 210 per cent of the full load running current when the 65 per cent voltage tap is used.

The motors are controlled individually by push buttons from several

Typical "reduced voltage" motor-starting enclosed panels. Each of the three 1,500-hp. motors has its separate oil circuit breaker and auto-starting equipment. The incoming power panel is open (left side) showing the 1,200-amp. oil circuit breaker withdrawn for inspection

oil through the 24-in. line will be about 13 cents per barrel at 100 per cent load factor. At 90 per cent load factor, the cost may be 15 cents per barrel. From various sources it is reported that the shipping of oil from the Gulf Coast to New York by the most efficient tankers costs slightly more than 16 cents per barrel under peacetime conditions; average costs of moving oil between these points in a tanker fleet, including tankers of different kinds, is reported to be about 22 cents per barrel. Railroad freight rates for shipments by tank car from East Texas to the New York-Philadelphia area are about $1.70 per barrel.

The tonnage of steel required for the 24-in. line is much less than the tonnage needed for building 25,000 to 30,000 tank cars which might deliver 300,000 bbl. per day between Texas and the East Coast. Furthermore, the manpower for building tank cars would be harder to obtain than the manpower for building the 24-in. line.

Line on skids ahead of lowering-in gang. In the foreground is Paul Reed of the Journal staff on one of his trips along construction operations of the WEP line

Striking conclusions are reached in comparing the power necessary for moving 300,000 bbl. daily through a 24-in. line on one hand and through 12-in. lines. With an equivalent number of 12-in. lines giving the same capacity as 24-in. pipe at the same pressure drop, the friction coefficient would be 25 to 30 per cent greater and consequently the power input would be increased proportionately. The relation of skin friction to the volume handled is so much less in the case of the larger pipe that 30 per cent less power is required for moving a barrel of oil through 24-in. pipe than through 12-in. lines moving 300,000 bbl. daily under the same conditions. This is another indication of the great competitive advantage which the 24-in. line has over the 12-in. lines which have been standard large-diameter crude lines used by the oil industry. Of course it is necessary to keep in mind that only in an exceptional situation, such as the WEP project serves, would 24-in. lines be practicable.

The low cost of operating the WEP system compares favorably with that of good crude-oil trunk-line experience where a cost of $0.0003 per bbl.-mile is considered to be fairly low. Transportation through the 24-in. line will cost about $0.0001 according to the figures arrived at in studying assumptions previously made in this article regarding costs. In other words, it will cost about one-third as much to move a barrel of oil through the 24-in. line as it would to move it through a good standard 12-in. trunk line.

Before the building of the WEP line, there was no correct basis for comparing pipe-line transportation with tanker transportation because there was no pipe lines in existence designed to compete with tankers. With the exception of the WEP system, lines connecting the Gulf Coast with the East Coast have been a patch-work of systems some of them dating from the early 1900's; they were originally intended for the most part, primarily to serve western refineries. Linking them together for Gulf Coast-East Coast shipments has been a secondary consideration, coming with war conditions.

Peacetime Status

Under peacetime conditions, it would be impracticable for major oil companies to build a 24-in. pipe line from Texas to New York, even though it might be clearly demonstrated that the per barrel transportation cost would be less by this pipe line than by tankers. The reason that it would be impracticable would be that such a line would call for heavy amortization charges against the investment in tankers which would be prohibitive from a financial standpoint. Tankers have flexibility which has advantages. When peace comes, with the 24-in. crude pipe line fully established and in operation, there will be no justification for building tankers to perform transportation functions which the pipe line is prepared to handle. Since tankers will not be able to compete with the 24-in. pipe line, any future provision which will be made for tankers running between the Gulf Coast and the East Coast will be done with a recognition that the WEP 24-in. trunk line is the basic transportation system for crude shipments from Texas to the East Coast. The cost of getting the oil to the shipside of tankers would be about the same as costs for getting oil into the WEP 24-in. line. A products line from Gulf Coast points to the East Coast would operate fully as favorably if not more so.

To compete with tankers, a line should be of large diameter and operated at near capacity in order to reduce cost per barrel to a point competitive with tankers. It should follow a shorter route than tankers because the cost per barrel-mile actually traveled by tankers is very low in peacetime.

When peace comes conditions for low cost of WEP transportation are likely to be even still more favorable because part of the cost of WEP will have been amortized and the Government could afford to sell the system at a reduced figure, giving a

(Continued on Page 77)

Electric Installations

*by W. H. Stueve**

A GREAT amount of interest has been evidenced in the electrical features of the largest-diameter pipe line ever constructed to transport petroleum and petroleum products now being installed from the Mid-Continent oil fields to eastern tidewater.

Electric power, purchased from existing utilities, was selected to provide the pumping energy, for the reason that the large capacity of the pipe line made it practically imperative that centrifugal pumps be used for the capacity of 300,000 bbl. per day. This amount of oil, when compared to volumes of water, is about one-half of the total water consumed daily by cities like Tulsa and Oklahoma City. Steam-turbine drive would have required more critical materials than the motors and condensing water required at each pump station would have been too great a problem to consider steam drive. If diesel engines had been considered they would have required more critical materials than motors and the speed-increasing gears necessary could not readily be secured. After giving consideration to all these factors and after weighing carefully the operating flexibility of electric motors—the lesser maintenance, the lesser operating labor required and lower first cost of the electric motor pump stations—the electric induction motor was selected, with the hope that the power supply could be arranged for at an equitable figure. All the power companies, in whose service territory the pumping stations are located, have cooperated to the greatest degree and the contracts temporarily negotiated have fully justified this decision.

Station Equipment

There will be twenty-five 4,500-hp. pump stations installed between the origin and terminal of the 24-in. line at Phoenixville, Pa., spaced about 52 miles apart in the comparatively level portions of the line, with working initial pressures at each station of the order of 700 to 750 lb. per sq. in. On the western slope of the Appalachian mountains south of Pittsburgh, Pa., the pump stations are spaced somewhat closer together due to the uphill static head; whereas, on the downhill eastern slope of the mountains in Pennsylvania, the stations are spaced at a greater distance than average.

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The motor-starting equipment is either of the full-voltage (FV) "across the line" type or "reduced voltage" type (RV), depending on the power-supply requirements.

In the stations where the across-the-line starting equipment is used, the momentary power inrush may approach 500 per cent of full load running current in amperes; whereas, in the stations having installed reduced-voltage starting equipment the inrush current in amperes is only 210 per cent of the full load running current when the 65 per cent voltage tap is used.

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Typical "reduced voltage" motor-starting enclosed panels. Each of the three 1,500-hp. motors has its separate oil circuit breaker and auto-starting equipment. The incoming power panel is open (left side) showing the 1,200-amp. oil circuit breaker withdrawn for inspection

points throughout the building, even from the pump room itself. The station lighting is taken from a 25-kva. secondary transformer banked in with two 15-kva. transformers to deliver three-phase power for sump pumps and other smaller motors.

In some stations a 100-hp. suction booster pump is installed to provide about 15 lb. per sq. in. pressure to the suction side of the first-stage large pump when viscosity changes in the fluid being pumped require.

The main 1,500-hp. motors have been tested in the shops under loaded conditions and have been certified to meet their original guarantees of being 94.4 per cent efficient at both three-fourths and full load. The power factor of the motors as disclosed by the shop test, when under full load, will be 92 per cent, meaning that the electric input in kilowatts to the motors will be 92 per cent of the kilovolt-amperes supplied by the secondary winding of the three-phase transformers.

The temperature rise of the motor windings under full load will be only three-fourths of the maximum guaranteed rise above ambient temperatures.

The power companies supplying power to the stations will construct an average of about 8 miles of various primary voltage power lines to serve each of the 25 pump stations. The longest power line required is 56.6 miles long for the No. 8 station located on the Arkansas-Missouri state line near the St. Francis River; whereas, the shortest line is only several hundred feet for the No. 5 station near Little Rock, Ark.

Ample electric-power generating capacity to serve these 25 pump stations, amounting to 90,000 kw., has been found readily available along the path of the pipe line from Texas to New Jersey. In only several instances has it been found necessary to reinforce existing power systems, and in one case a single power company will serve needs in form of the pump stations. In the other case at

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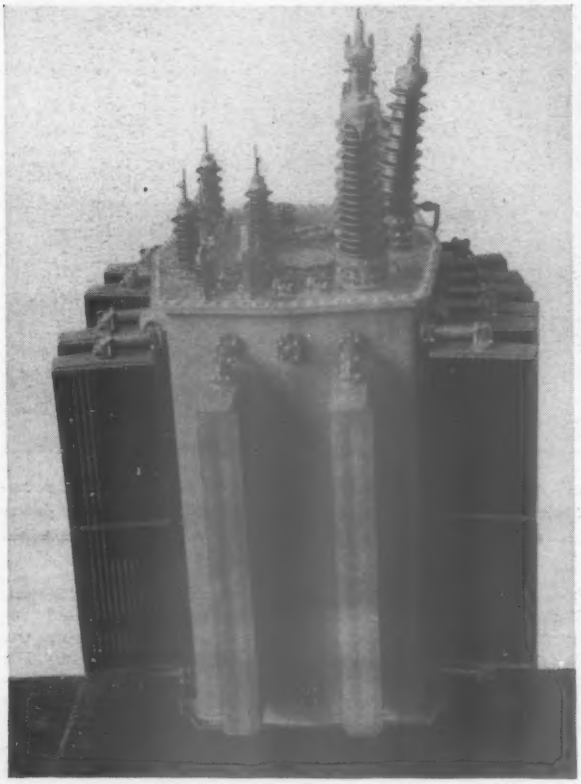
TABLE 1—Electric Power Supply Requirements

Station No.	Nearest town	Power supply company	Installed total horsepower	Motor starting equipment	Power supply voltage	Distance to nearest supply (miles)
1	Longview	Southwestern Gas & Elec. Co.	4,800	FV	66,000	0.6
2	Atlanta	Southwestern Gas & Elec. Co.	4,500	FV	66,000	2.1
3	Hope	Arkansas Power & Light Co.	4,600	FV	110,000	6.8
4	Malvern	Arkansas Power & Light Co.	4,500	FV	110,000	11.8
5	Little Rock	Arkansas Power & Light Co.	4,500	FV	110,000	.1
6	Bald Knob	Arkansas Power & Light Co.	4,600	FV	110,000	1.4
7	Sedgewick	Arkansas-Missouri Power Co.	4,600	FV	110,000	13.8
8	Fagus	Arkansas-Missouri Power Co.	4,600	RV	110,000	48.0
9-A	Oran	Missouri Utilities Co.	1,500	RV	33,000	1.0
9-B	Thebes	Central Illinois Pub. Serv. Co.	2,500	RV	66,000	18.0
10	Anna	Central Illinois Pub. Serv. Co.	4,500	RV	66,000	9.0
11	Norris City	Central Illinois Pub. Serv. Co.	5,700	RV	66,000	.3
12	Princeton	Indiana Public Service Co.	4,500	RV	33,000	1.5
13	French Lick	Indiana Public Service Co.	4,500	RV	33,000	8.0
14	Seymour	Indiana Public Service Co.	4,500	FV	33,000	2.5
15	Oldenburg	Indiana Public Service Co.	4,500	RV	33,000	6.0
16	Lebanon	Cincinnati Gas & Electric Co.	4,600	FV	66,000	12.0
17	Circleville	Columbus & So. Ohio Elec. Co.	4,500	FV	66,000	16.0
18	Cooksville	Ohio Power Co.	4,500	FV	66,000	3.0
19	Sarahsville	Ohio Power Co.	4,500	RV	33,000	10.8
20	Wind Ridge	West Penn Power Co.	4,500	RV	25,000	13.0
21	Connellsville	West Penn Power Co.	4,600	RV	25,000	1.0
22	Rockwood	Pennsylvania Electric Co.	4,600	RV	22,000	5.0
*23	Chambersburg	Potomac Edison Co.	4,600	FV	66,000	1.5
24	Marietta	Pennsylvania Power & Light Co.	4,500	FV	66,000	3.0
25	Phoenixville	Philadelphia Electric Co.	5,000	RV	33,000	11.0
†26	Lambertville	New Jersey Power & Light Co.	5,000	RV	33,000	1.0
			119,800			208.2

*Only 3,000 hp. required normally. †Midway on 20-in. Phoenixville to Bayonne.



Above: Typical of three motors used in each pump station, each 1,500-hp. induction motor 1,785-r.p.m., 2,300-volt direct connected to single-stage centrifugal pump. Air ventilating duct to be attached on top. Left: Typical three-phase transformer, 3,750-kva. capacity to step down incoming high-voltage power to 2,300 volts for large motors

STATIONS

Electric centrifugal pumps, totaling 4,500 hp. at each station, to move oil through WEP line

OIL will be moved through the WEP line by electric centrifugal single-stage pumps operating in series, with three 1,500-hp. units totaling 4,500 hp. at each station spaced at intervals of an average of about 50 miles for the length of the line. Operating pressures will be between 725 and 740 lb. As a result of studies made in connection with the design of the line, it is believed that pressure drop will be 12.9 lb. per sq. in. per mile for 65-second oil of 0.85 specific gravity. However, since the line had to be designed without the aid of any previous experience on the part of the industry in the transportation of oil through a pipe line with a diameter as large as 24 in., it has been necessary for estimates to be conservative. After the line has been in operation, studies of flow conditions may show that pressure drop may be 94 per cent of what has been anticipated.

In other articles in this section matters concerning electrical equipment and pumps are discussed in considerable detail. In addition there are a number of significant features of station equipment and future operating methods which will be discussed in this article.

Station equipment is enclosed in a building 60 ft., 4 in. by 36 ft., 8 in. Within this rather limited space motors, pumps, switch gear and control panels are located in a compact manner. In order to save critical materials, transformers are placed close to each station. A fire wall separates pumps from the motors. Standard stations along the line are identically the same. There are certain deviations from standard stations in the case of the terminal stations at Longview and Norris City and at station No. 9 which has been split into two stations to meet the requirements of a local power situation, near the Mississippi River.

Piping for the stations, including connections for scraper traps and strainers was fabricated at a central yard, near Little Rock, in advance of the construction of the stations.

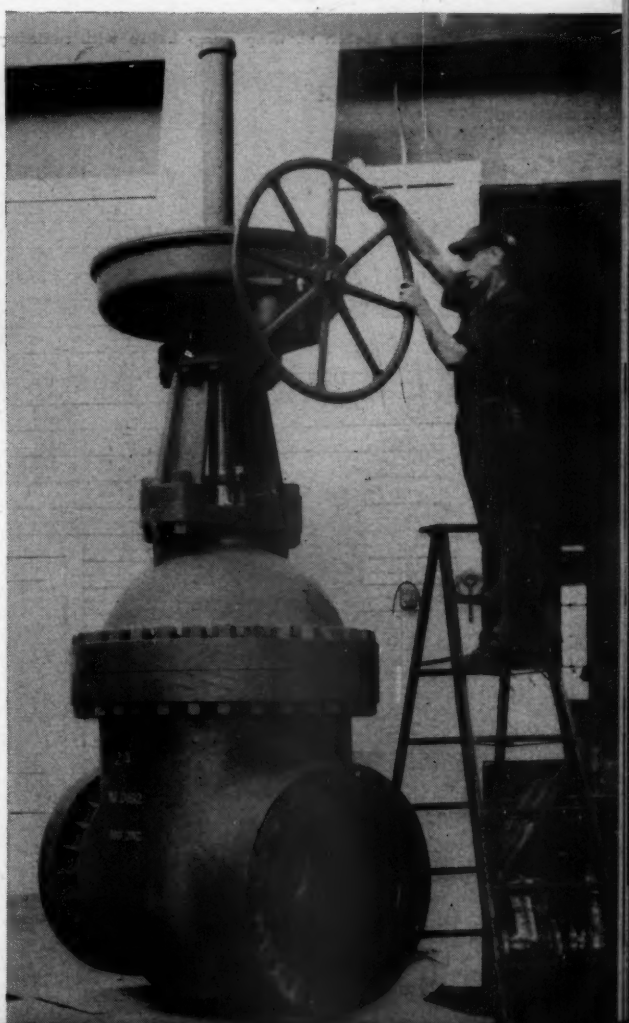
The three single-stage, high-pressure pumps develop 630 to 680 ft. of head; each is operated under flooded suction; manufacturers require 15 lb. on the suction side of the pump.

At the Longview terminal, where oil comes to the station from tankage, low-pressure booster pumps develop 15 to 30 lb. pressure to pump oil to the main suction line of the station to avoid difficulties with cavitation.

No tankage will be installed at intermediate stations between the terminals on the Texas-Illinois leg. However, tanks will be installed at stations in the mountains of Pennsylvania.

At the Longview terminal, sixteen 80,000-bbl. tanks are being provided for holding shipments of crude oil and heating oil. The pump station itself is 1½ miles from a Humble Pipe Line Co. trunk-line station, with which it is being connected by an 8-in. line. Oil from all other systems is transported through lines of the feeder systems branching into the field, one for crude oil and the other for heating oil. The 16-in. heating-oil gathering system connects with pump stations of Pan American, Shell and Sun-Stanolind systems which are being converted from crude-oil service and reversed for moving heating oil from Gulf Coast refineries. Lines of the feeder system connecting with the Longview terminal are: 16-in. for heating-oil system and 24-in. for sys-

Above: Piping for all stations was fabricated at a central welding shop near Little Rock, Ark.



Right: The 24-in. valves weighing 7½ tons are larger than the main-line station pumps and motors

tem bringing crude from all stations except Humble.

In East Texas it is reported 65 miles of water has been put into the line ahead of the oil. This water has been pumped in by slush pumps from rotary rigs which have been rented and installed at the Atlas Pipe Line Co. station, near a water reservoir, close to the Sabine River.

Because of their great size and the important service they are to perform, much attention has been attracted to the 24-in. main-line gate valves for the line which are all made by Darling Valve & Manufacturing Co.; these are of the fully revolving, double-disk, parallel seat design. Since 24-in. valves of 1,600-lb. test pressure had never been built before, it was necessary to do special design and pattern work before these valves were manufactured.

Valves for much lower pressure service had been previously built for lines as large as 72 in. in diameter.

Valves for the WEP line weigh 7½ tons; they are 12 ft. tall; the distance from face to face of the end of the 52½-in. diameter flanges is over 4 ft.; thickness of the high-nickel content metal is 4 in. The body bonnet stud bolts (2 in. by 13¼ in.) are of a 125,000-lb. tensile strength special alloy. The valve is of outside screw and yoke type; it is operated by bevel gear and has a totally enclosed gear case. The valve stem is so big that both of one's hands will just reach around it. The hand wheel is 3 ft. in diameter. The stem protector on top of this outside screw and yoke design has an indicator to show the position of the gates. With the ball-bearing operation, the operator finds it relatively easy to open or close this valve even when the differential pressure is the maximum line pressure. As in the case of 24-in. valve, special designs and patterns were required for the 18-in., 1,600-lb. horizontal swing check valves and the 18-in. and 16-in., 1,600-lb. test gate valves.

Dispatching

Dispatching of shipments through the line will be directed from a central office. Orders and other messages will be transmitted to the stations by teletype. The communication system consists of lines furnished by American Telephone & Telegraph Co. It is customary for a teletype message to appear at all stations along the line simultaneously in order that all operators may be familiar with all existing conditions.

If a unit at a station is shut down temporarily, the valves of the remaining two units at the station will be pinched down. In case the shut down of a unit should last for more than a few hours, the entire station will be shut down as well as half the stations along the line at alternating locations.

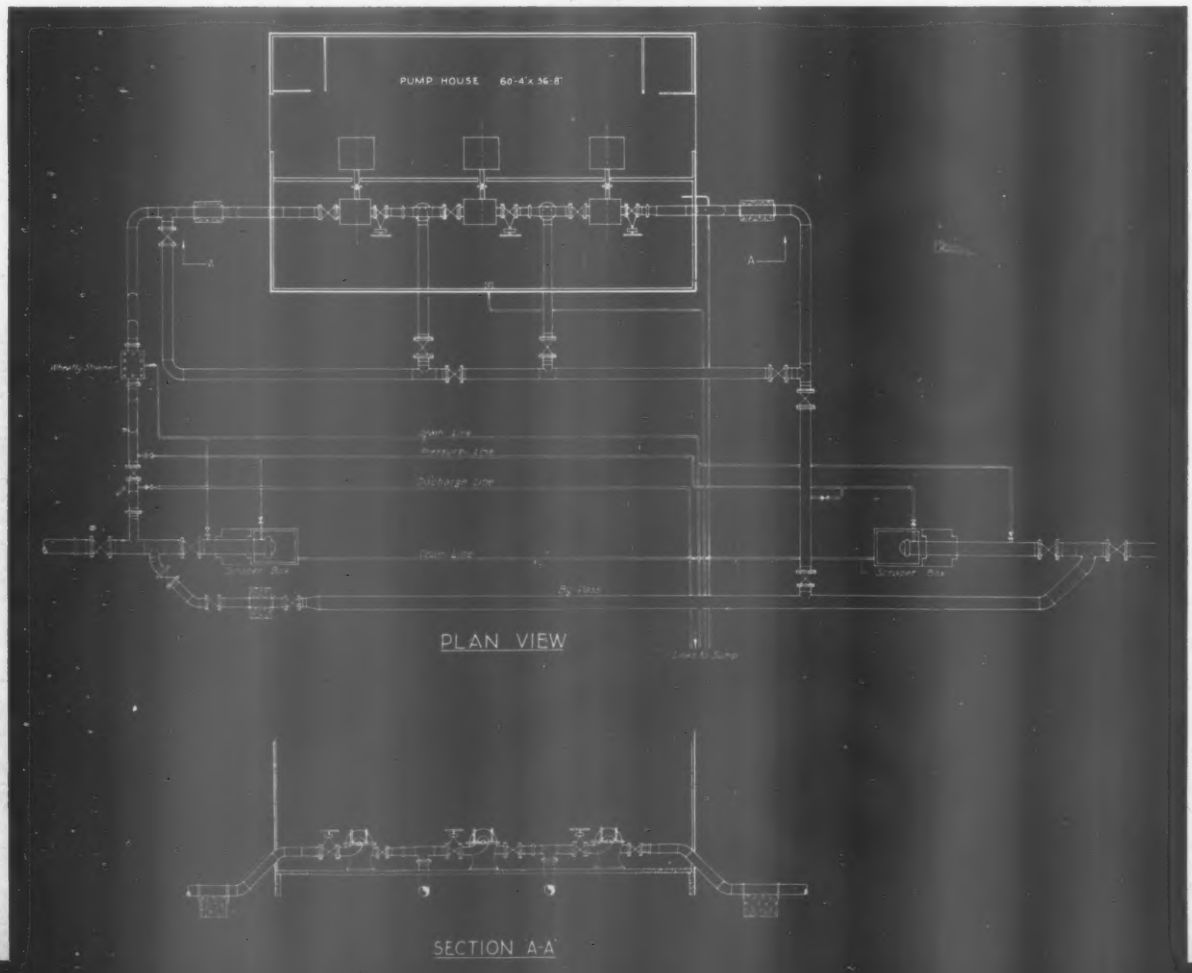
If every other station along the line—that is, if half the stations—are operating, it is estimated that flow would be reduced by 120,000 bbl. roughly, and the remaining stations would pump about 180,000 bbl.

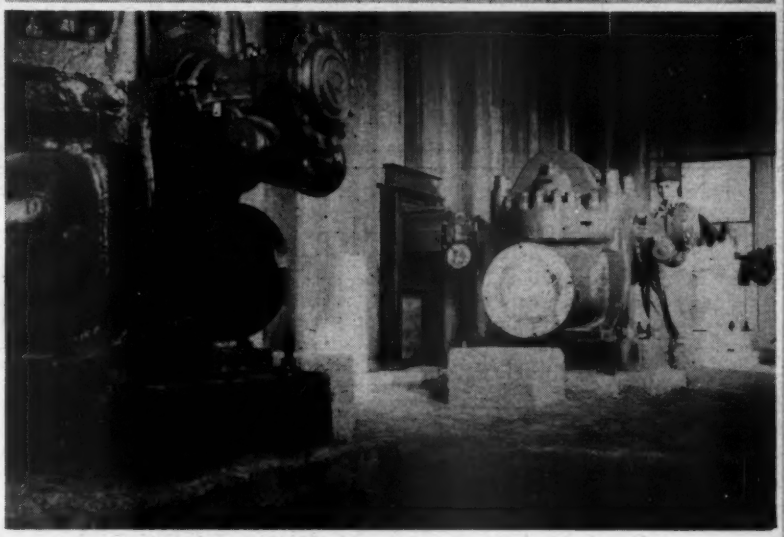
Three emergency stations will have six units altogether, with two units at a station which will be available for standby service anywhere along the line when they are needed. Two or three extra 24-in. gate valves and a supply of spare parts for pumps and motors will be held at convenient points.

After the line is completed, it will be maintained by three crews, one of which will be located at Little Rock. Each crew will be equipped with portable pumps, welding machines, clamps and sleeves, for sealing breaks in the line and digging tools.

If the 20-in. products line is built according to plans which are now being discussed, the stations on the WEP 24-in. line from Bald Knob, Ark., would be enlarged by the installation of additional pumping units which can be operated by the same station personnel. It is also believed that maintenance could be handled by the same organization.

Typical pump station showing pump house with centrifugal and electric-motor installations, station piping, strainer, and scraper boxes

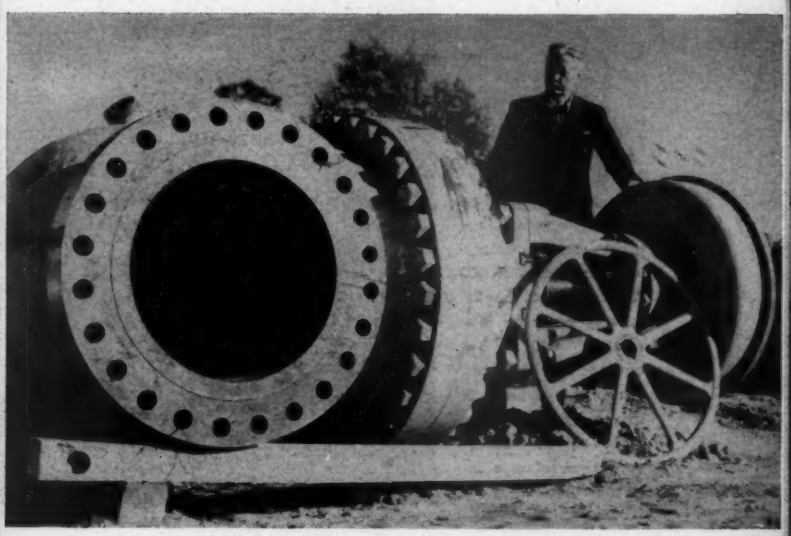




Above, left: View of 1,500-hp. electric motors at main-line station. Above, right: Station building with poles for supporting transformers. Right: Single-stage centrifugal pumps in series

Below, left: Seven-strand steel wire used as conductor for transmission lines because of shortage of copper wire. Below, right: A 24-in. valve awaiting installation at a terminal station

PUMP STATIONS UNDER CONSTRUCTION



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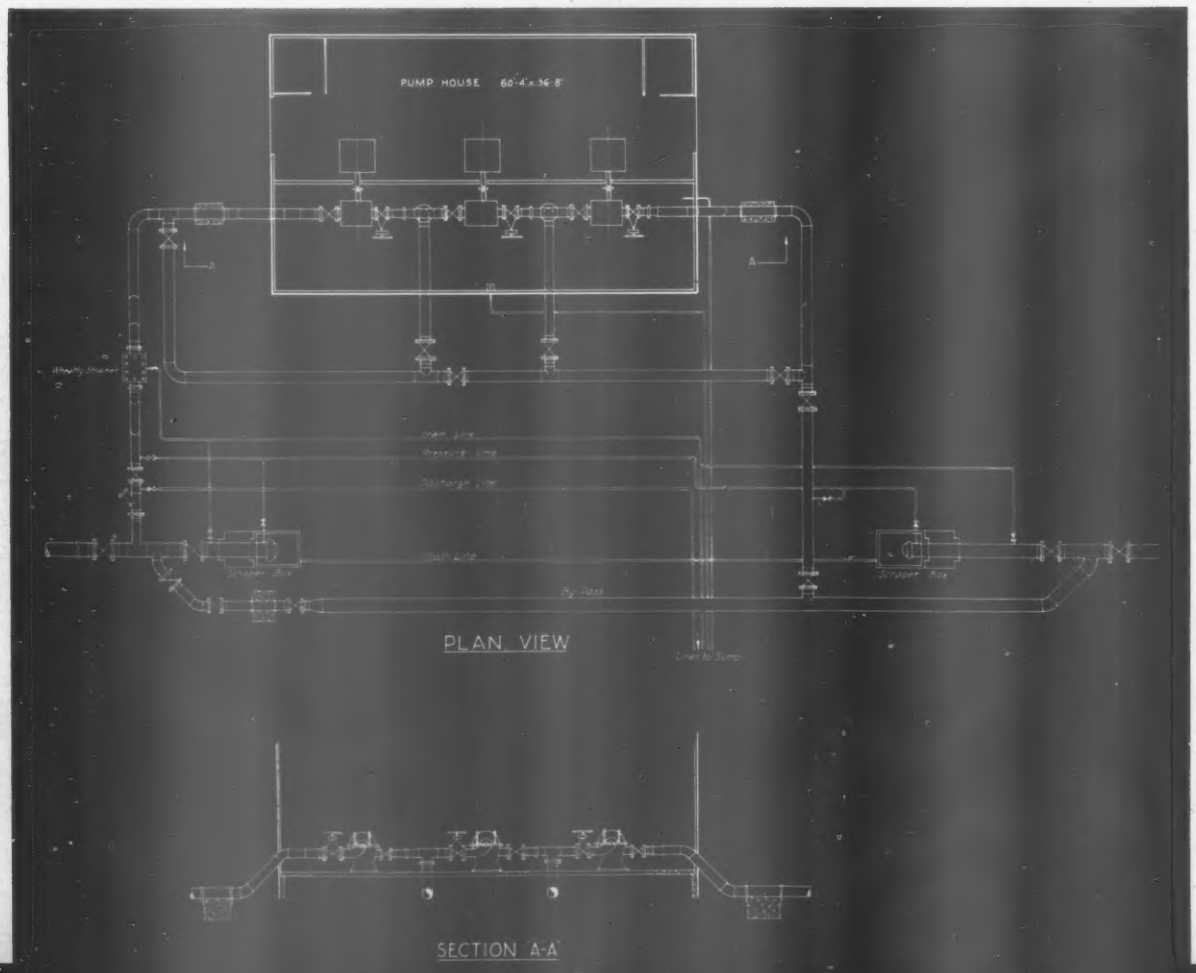

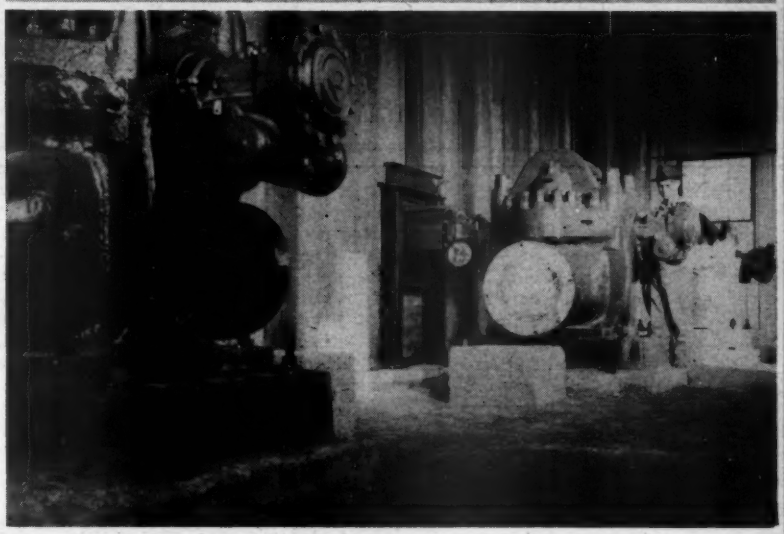

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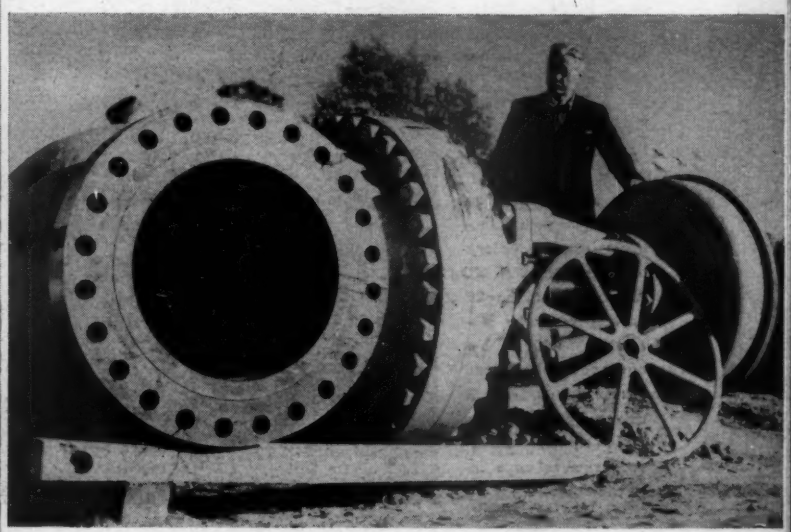

Electric Motors for the War Emergency Pipe Line

*by W. G. Taylor**

THE fact that manufacturing capacity was available to build electric motors to drive the pumps made the 24-in. 1,388-mile War Emergency pipe line a practicable project to give relatively quick relief in the critical oil situation in the states along the Atlantic Coast. War demands would have prevented timely production of any other type of pump drive. Although from the standpoint of public benefit this was the most important factor, electric drive permitted the minimum use of critical materials such as steel, lowered the cost of installed equipment, and required smaller station buildings. It permits direct connection of highly efficient motors and pumps, and will simplify operation routine and assure low maintenance expense.

This brief account will be devoted to the motors involved, without particular reference to the details of power supply, transformers and motor-starting and switchgear equipment necessary to put the motor-driven pumps into successful operation and to keep them running night and day. The entire pipe line requires the use of 29 booster pumping stations. All but two of these will be equipped with three main pumps, each driven by a 1,500-hp. 1,800-r.p.m., 2,300-volt, squirrel-cage induction motor. The other two stations, known as No. 9A and No. 9B, located respectively in Missouri and Illinois, are really a splitup of a single station for the purpose of utilizing two sources of power, because the power supply available in one state was limited in capacity and could provide for only one 1,500-hp. motor. Consequently, station No. 9A has one main pump and station No. 9B has two. The total number of 1,500-hp. motors on the entire pipe line is 84.

These motors have been built by two manufacturers, and are closely alike in design. They are interchangeable as to mounting dimensions so that motors of either make may be used at any location. Each motor is mounted on two sole plates which have been standardized for this project and which are grouted in the foundation. Each motor has an 18-in. shaft extension to extend through a fire wall located in each station between pumps and motors, and is connected to the pump shaft by a flexible coupling. A seal is used around the shaft at the fire wall to exclude gases from the motor room which might emanate from the pump room.

The motors are of the open type and are self-ventilated by fans built integrally with the motor. Air from the motor room is drawn into each end of the motor and discharged upward through an opening in the top

*Petroleum and Chemical Section, Industrial Engineering Department, General Electric Co.

Fig. 1—The first two 1,500-hp. motors for the War Emergency pipe line undergoing tests in General Electric's motor factory in Schnectady, N. Y. All but 2 of the 29 booster pumping stations will be equipped with three main pumps, each driven by a 1,500-hp., 1,800-r.p.m., 2,300-volt, squirrel-cage induction motor

of the motor frame. In this respect, these motors depart from the normal practice of discharging air downward at each side, the object being to avoid recirculation of warm air through the motors when three of them are mounted side by side. Such recirculation might cause their overheating, particularly in the case of the motor in the middle of the group.

It is an interesting fact that with three 1,500-hp. motors in a station, all operating at full load, approximately 225 hp. of energy will be discharged into the motor room in the form of heat. This necessitates a station ventilating system with exhaust fans, arranged to keep the motor room temperature comfortable at all times, and to supply heat to the pump room. An exhaust fan, driven by a 1-hp. motor, will be located over each 1,500-hp. motor, with the air duct intake in line with the air outlet in the top of the motor frame but not connected to it, thus avoiding all difficulties.

Electric Motors

The main motors are designed for starting at full voltage with a starting current not to exceed five times full-load current, the object being to lessen the starting current peak on transformers and power circuits. Control equipment for full-voltage starting will be installed at 14 stations, and the remainder will be equipped for starting the motors at reduced voltage.

Since this pipe line is the largest oil trunk line in the world, it follows that the main pump motors are the highest in capacity so far built for this service. Each motor weighs 5½ tons, and is approximately 4½ ft. high, 4½ ft. wide, and has an overall length, including extended shaft, of a little over 7 ft. For the amount of horsepower which these motors can deliver, these dimensions may appear small, but this is due to the fact the motor runs fully loaded at a speed of about 1,785 r.p.m. Consideration was given to a 3,600-r.p.m. design, but the lower speed resulted in better pump efficiency and lower over-all cost of the pumping unit, as well as better motor-starting characteristics and earlier deliveries from the manufacturers.

A number of auxiliary pumps are necessary in the various pumping stations. At each station there is a 20-hp. sump pump, driven by a 220-volt explosionproof motor. Station No. 1 at Longview, Tex., is equipped with three 100-hp., 1,800-r.p.m., 2,300-volt, explosionproof motors driving suction pumps located outside the main station and used to deliver oil from the tank farm into the pipe line.

At station No. 11 at Norris City, Ill., which is the temporary terminus of the first section of the pipe line which will soon be ready for operation, several additional pumps are installed, all located within the station and driven by open-type, 2,300-volt, squirrel-cage induction motors with shafts extended through the fire wall. Two 350-hp. 3,600-r.p.m. motors drive pumps for delivery of some of the oil through a branch pipe line to the Illinois Pipe Line at Enfield, Ill., 16 miles north of Norris City. When the eastern extension of the 24-in. line is completed, it is possible that two more 350-hp. pumps will be added to the Norris City station for the same purpose.

For temporary use at Norris City, three 250-hp., 1,800-r.p.m. motors drive loading-rack pumps, for oil delivery to tank cars until the eastern extension is ready for operation. These pump units will then be moved to station No. 25 at Phoenixville, Pa., where they will serve as booster pumps to supplement the main 1,500-hp. pumps.

Also at Norris City there are three 100-hp., 1,500-r.p.m. motor-driven pumps serving the same purpose as those of the same size at Longview. Oil reaching Norris City from the south will be delivered to tanks in case of an emergency shutdown at any point east, and will be repumped into the line by means of these pumping units.

Additional booster pumps will be required at several points on the eastern part of the pipe line to assist the main 1,500-hp. pumps in raising the line pressure to the amount required by the spacing of the stations and the elevations of various sections of the line. There will be five 100-hp., 1,800-r.p.m. motor-driven pumps, one each located at stations No. 16 at Lebanon, Ohio; No. 21 at Connelsville, Pa.; No. 22 at Rockwood, Pa.; No. 23 at Chambersburg, Pa., and No. 24 at Marietta, Pa. Eventually, as already mentioned, there will be three 250-hp. motor-driven pumps at station No. 25 at Phoenixville.

Branch Stations

At Phoenixville the line splits into two 20-in. branches, one going to the area near Chester, Pa., and the other to the New Jersey coast at Bayonne. On the latter branch, there will be three pumping stations, but only one of these will normally be in service. The other two will be held in reserve, for use in case it may be desired to deliver the entire 300,000 bbl. daily capacity of the main line through this smaller branch to New Jersey. At each of these three stations, there will be one 500-hp., 1,800-r.p.m., motor-driven booster pump to produce the additional pressure necessary to put this amount of oil through the 20-in. line.

It might be of added interest to mention that all motors on the pipe line which are connected to their pumps through station fire walls are designed with split-sleeve bearings and end shields at both ends, to facilitate inspection and renewal of bearings.

A summary of these motor installations on the "big inch" pipe line shows a total installed motor capacity as follows: 84 main pump motors, 126,000 hp.; 8 auxiliary booster pump motors, 2,000 hp.; 6 suction pump motors, 600 hp.; 3 loading rack pump motors, 750 hp.; 2 delivery pump motors, 700 hp.; 29 sump pump motors, 580 hp.; 84 exhaust fan motors, 84 hp.; total approximate installed capacity, 130,714 hp.

To this total should be added various motors required at eastern delivery points, and 700 hp. which may be installed later at Norris City. The total will be further augmented by motors for pumps to handle water from wells which will be drilled at many of the station sites where no adequate water supply is now available.

In these times of rapid war expansion of industrial and munitions plants from one end of the country to the other, most of which are requiring large blocks of electric power for manufacturing purposes, it is a notable example of the capacity and flexibility of our public utility systems that they can take on, with comparatively small effort, such loads as are involved in the operation of this world-record pipe line. Sixteen electric power companies will supply this power in the states of Texas, Arkansas, Missouri, Illinois, Indiana, Ohio, Pennsylvania and New Jersey.

Pipe Line Will Compete With Ocean Tankers

(Continued from Page 62)

still greater competitive advantage over tankers.

According to the plan under discussion, Defense Supplies Corp. would lease the WEP system from Defense Plant Corp. and operate it for moving petroleum shipments which it would buy at Longview, Tex., and sell to the vendors at East Coast terminals. The WEP organization would operate the line as agent for DSC. The low cost of operating the line will mean that the Government will effect large savings which will substantially reduce the financial burden of compensating oil companies for being deprived of tanker fleets needed in world-wide war operations.

During the war period the significance of the line from the standpoint of competition with tankers and other pipe lines may not be apparent because of the unusual manner in which the system's business will be conducted. For, instead of functioning as a common carrier with a tariff determined according to I.C.C. procedure, the line will be run by the Government so as to reduce to some extent the heavy obligations to oil companies.

FREEDOM COMES FIRST

The transportation of vital oil supplies is necessary to Victory. The O. E. Dempsey Construction Company takes patriotic pride in helping in the construction of the big 24-inch War Emergency Pipe Line, largest oil pipe line in the world.

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Oil and Gas Pipe Lines

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Record Time Made in Construction Program of First Leg of Line

by Paul Reed

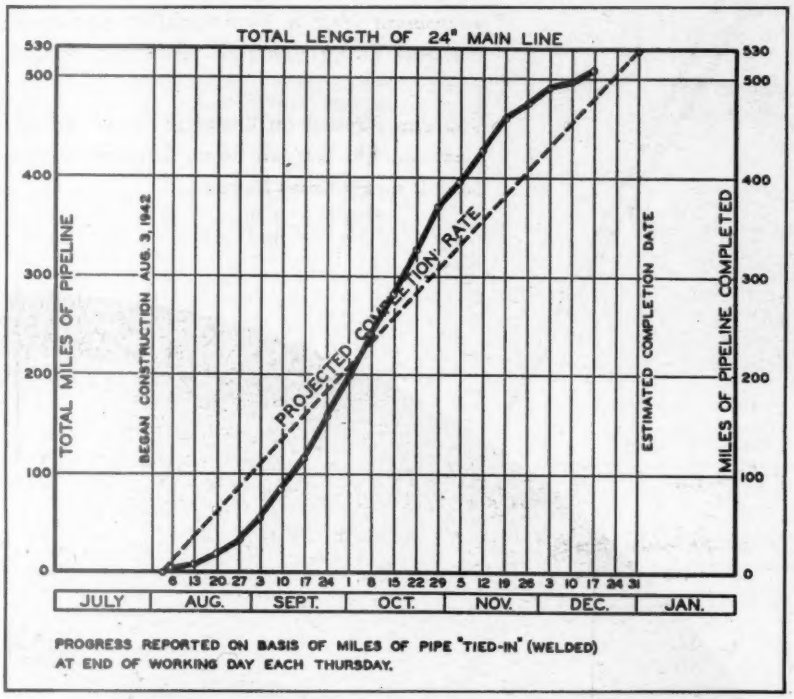
ON the whole, methods for laying pipe on the 24-in. line of the War Emergency Pipelines, Inc., project follow practices customary in modern construction of oil lines and large-diameter natural-gas lines. However, some changes evolved as the work progressed, because of certain problems met in laying this heavy pipe as rapidly as possible to meet needs of the critical national situation, produced by tanker withdrawals due to the war.

Although there have been both roll welding and stovepiping on the Texas-Illinois leg of the WEP line, stovepiping has been utilized to a much larger extent than was anticipated before the project started. Because of the difficulties encountered in handling heavy pipe, there were special advantages in having tractors of the largest sizes.

The pipe is 24-in., Grade B, seamless, with ⅜-in. wall, 23,200-lb. fiber stress; it has a factor of safety of 2.6. It is made in 40-ft. joints, each weighing approximately 2 tons (94.62 lb. per foot).

Although periods of wet weather delayed progress considerably, first at the southern end and later at the northern end, on the whole the work for the entire project went steadily ahead because there were only 2 days, October 30 and December 4, when weather conditions along the entire route were so bad that no pipe could be laid. Although much attention was attracted to interference with the work by labor unions, it is believed that time actually lost amounted to less than a week altogether.

A variety of terrain was traversed in laying the line to Norris City. At the southern end there was much timber and swampy country. Going north from the choppy country of Williams Brothers Corp.'s section, the line traversed the swamps of O. E. Dempsey Construction Corp.'s section where as much as 15 miles had to be corduroyed in the Sulphur River bottoms. Welding for Dempsey's spread was done by H. C. Price Co. Between this point and Little Rock, Ark., there was the rolling bauxite country and more than 8 miles of granite crossed by Anderson Brothers. From Little Rock to the Missouri State line, Oklahoma Contracting Co.'s two sections included low country with numerous drainage systems where fortunately a 68-day stretch of good weather prevailed; construction work was pushed rapidly to completion before wet weather set in. In Missouri, the section of C. S. Foreman Co. crossed fine farm land with drainage canals and ditches, particularly in the St. Francis River bottoms as well as the rough country near Cape Girardeau, Mo., on the Mississippi River. The section crossed by the Ray L. Smith Construction Co. contains rough and hilly country as well as low ground with mud which appeared to be bottomless, where horses were drowned and where tractors would become deeply imbedded in the mud. In places in the sections of Smith, Foreman and Dempsey, roads had to be corduroyed again and again, even as many as five times. After completing construction of northernmost Section 8, ending at Norris City, Ill., Sheehan Pipe Line Construction Co. assumed part of the construction in difficult Section 7 to the southwest. On finishing Section 5, Oklahoma Contracting Co. moved a spread to work in Sections 2, 3 and 6 before transferring crews and equipment to the northern extension.



Progress chart indicating how laying of WEP line went ahead of schedule during a large part of the construction program

Construction Methods

A discussion of construction methods can be handled most appropriately by taking them in the order in which they are conducted in the field.

Clearing of right-of-way was done by gangs employed by contractors engaged entirely for right-of-way work. The usual methods were followed for cutting trees, clearing stumps and generally preparing the ground for the passage of trucks and tractors. One of the contractors employed a power saw for cutting trees. With this it was possible to cut the tree

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We are proud to be selected as one of the contractors on this vital pipe line. First, because we're always ready to do all we can to help our country to win the Victory.

Second, because Exeter's pipe line division has come a long way in the 21 months since its organization. This rapid growth is due entirely to our efficient organization, modern equipment and a hard-working personnel that has many years of pipelining behind them.

You can depend on Exeter to "bust" schedules and get the job done, because we've done it many times before.

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Pipe Line Construction Division
Camp Hill, Penn.

so that the top of the stump would be flush with the ground. It is asserted that a saving of 20 men was effected where this was used.

Of much importance to successful construction of the line has been the stringing of the pipe. This had to be done rapidly. In some localities, ground was so swampy that trucks would bog down frequently. It one place the road had to be corduroyed 14 times. In fact, there were occasions where the stringing contractors' trucks had to be towed in by tractors. Some localities were so swampy and rough that pipe had to be snaked 2 and 3 miles to the right-of-way by boom tractors. In unloading pipe, it has been important that each joint be lifted by a crane and not dropped. Furthermore, when joints are moved along skids, four joints deep is the limit allowed. Care in handling of pipe was important in unloading from railroad cars and in unloading from trucks because unnecessarily severe dropping of pipe could result in eggshaping the pipe. This condition may be difficult to correct in lining up due to the unusual thickness of the pipe walls. The fact that stringing operations caused practically no delays in the progress of the work is a tribute to the effectiveness of the stringing organizations.

For digging the 36-in.-wide ditch required for the big pipe, a number of the ditching machines had to be equipped with larger buckets. In wet weather, there was much trouble with caving ditches, and owing to the great weight of the pipe and tractors carrying it, it was necessary to keep them from coming too close to the ditch.

Unique Ditching Method

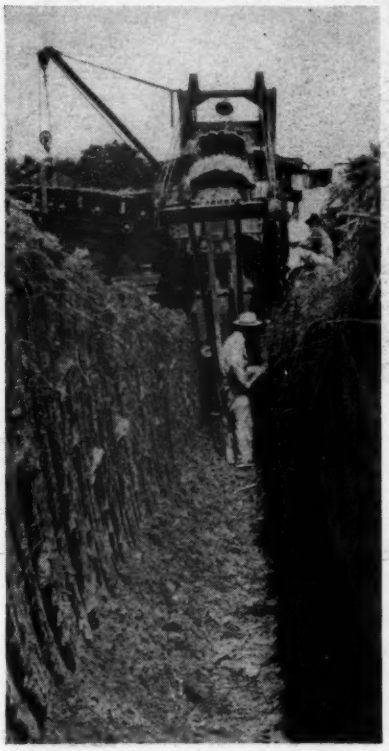
In completing its substantial portion of the Texas-Illinois War Emergency pipe line, Oklahoma Contracting Co. introduced a practical method of economically increasing the daily production of their trenching operations.

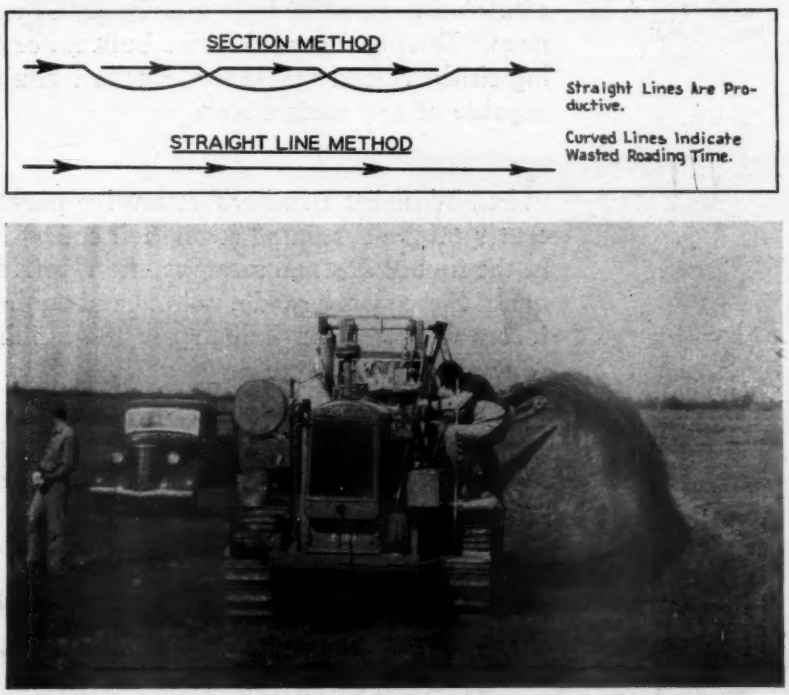
Previous practice of pipe-line contractors on jobs of this character was to lay out the ditching in sections and use two ditchers of the same size. This necessitated much wasted time in "roading" of the ditcher (when it had completed its section) around the section being cut by the other machine.

Oklahoma Contracting Co. used a "straight line" method of ditching by having each of its ditchers cut trench to one-half of the cut required for the depth of the trench. (The first machine cutting the upper half and the second machine cutting the bottom half.) This allowed both machines to operate in the top-range digging speeds and eliminated the waste time required in roading when using the "section" method.

The "straight line" method also was of benefit in case of service interruption to one of the machines, by eliminating any unditched portion between sections. Further, it eliminated the very severe service on the crawlers in the roading operations.

The accompanying diagram will probably make the contrast between the two types of operations more apparent.





Left: Large ditcher digging ditch 36 in. wide and 48 in. deep. Below: Diagram showing two methods of ditching. By the section method two ditchers dig to the full depth required. To pass the section dug ahead each ditcher must be "roaded." By the straight-line method the first ditcher digs the upper half of the ditch while the second completes the ditch. Bottom: Ditcher of type digging upper half of ditch where straight-line method was used

The specifications for the laying of the extension eastward are essentially the same as those used in the laying of the Texas-Illinois extension.

Before the work was originally undertaken for the Texas-Illinois leg it was generally anticipated that the roll-weld method would be used for laying the pipe. There still is considerable difference of opinion among construction men engaged on the line in regard to the comparative merits of stovepiping and roll welding. It is claimed that each has advantages under certain conditions. However, there has been a considerable increase in the use of stovepiping.

Following Oklahoma Contracting Co.'s early experience on the line which demonstrated that the 24-in. pipe could be laid fast by stovepiping, there was a tendency to use more and more stovepiping by the other contractors. After construction had been under way on the Texas-Illinois leg for 1½ months, the main-line spreads were stovepiping most of their work. It is reported that nearly all the 17 spreads on the Illinois-East Coast section will employ stovepiping to a

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THIRTY years' experience in the construction of pipe lines, river crossings and pump stations and general contracting enables Williams Brothers Corporation to render an intelligent, efficient and speedy service in building parts of the War Emergency Pipe Line, largest oil pipe line in the world.

IN the past three decades, Williams Brothers Corporation and affiliated companies built nearly 20,000 miles of important pipe lines. During this period, we built an organization of engineering skill, trained workmen, modern equipment and machinery capable of any assignment.

YES, Williams Brothers' executive personnel and construction crews got their training (won their spurs) in the fields and forests, in the mountains and swamps, the rivers and lakes of two continents. So we were ready, willing and equipped to join the fighting forces of American industry in the building of the War Emergency Pipe Line.

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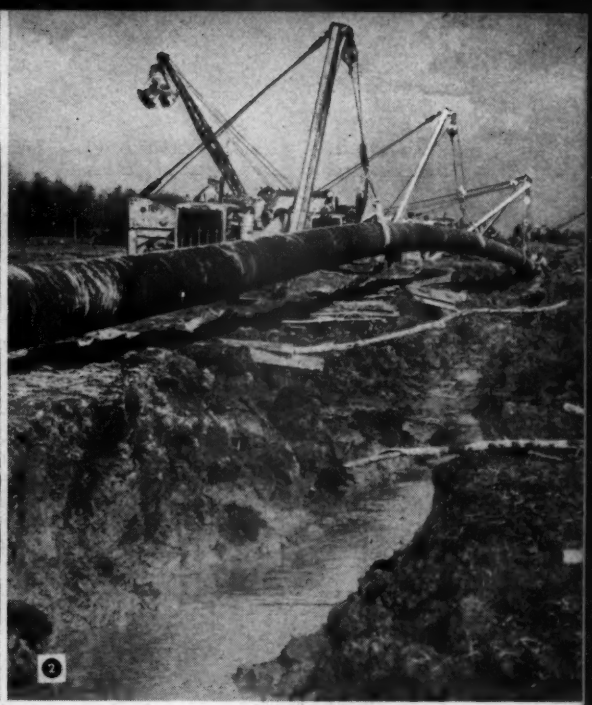

Photographs 1 and 2 courtesy the Barrett Division

PUTTING PIPE INTO GROUND

(1) Heavy 24-in. pipe tips tractor counterbalanced with additional weights for service on the WEP project. (2) Pipe being lowered into ditch after a spell of rainy weather. (3) Boring by hand for a road crossing. In some sections boring was done by a power-driven machine. (4) Five large tractors were frequently used for lowering in. (5) To prepare for river crossings, pipe was double coated and wrapped, covered with wooden slats and weighted with river clamps

large extent. Owing to winter conditions and mountainous country, stovepiping on the eastward extension will be advantageous.

In visiting construction work where stovepiping is used, it is observed that pipe is supported sufficiently high above the ground or the ditch to facilitate the work of the welders. This support is furnished by cribbing with heavy skids. One contractor, using 6 by 8-in. skids, had practically no trouble with breaking of skids. This heavy skid proved to be much more satisfactory than smaller-sized skids. The high cribbing for supporting pipe during welding operations is one of the distinctive features of the construction of this line when compared with that of other crude-oil lines. Where the condition of the ground warranted, the pipe was cribbed directly over the ditch for stovepiping operations.

Specifications permitted contractors to weld with either three or four beads. This optional arrangement enabled contractors to use the method which was best adapted to the equipment they possessed. More than 85 per cent of the spreads welded with three beads.

In roll welding, it was found that one type of dolly had to be discarded in order to change to a flatter roller so as to avoid denting the pipe. To complete a so-called bell-hole weld, 40 to 45 minutes were required.

Single joints and welded sections of pipe are cleaned out by a man known as the "human swab," who glides through the pipe on a rack supported on roller skates. He swabs out dirt and other debris which get into the pipe while it is lying on the ground and which would cause trouble after the line is in operation. Without the human swab, the inside of the pipe would have been cleaned out at considerably greater expense by plungers pushed through the pipe manually with considerable effort.

Welders are tested before being employed and coupons are cut from the pipe and tested at regular intervals according to customary practices. Testing equipment for making the pulling, bending, and nick-break tests was kept in the field warehouse of each spread.

When the work started, two types of clamps were used. One of these was the narrow type of clamp which has been satisfactory for thin-wall natural-gas pipe which could be readily pulled into the desired alignment through applying pressure on a narrow area. After several months of construction, it is reported that the type of clamp with very wide cross bars gripping a much larger area proved to be more satisfactory.

W. R. Finney, manager of pipe-line operations, Standard Oil Co. (New Jersey) and member of WEP advisory committee, has had a prominent part in plans and negotiations of the last 2 years for transporting oil by the large-diameter pipe-line system from Texas to the East Coast area

Because of the need of pushing construction work ahead rapidly, welding was not tested by air pressure. The few defects in welding which occur in a modern line can be spotted in a satisfactory manner by a hydraulic pressure test of 1,000 lb. per sq. in. after the line is completed.

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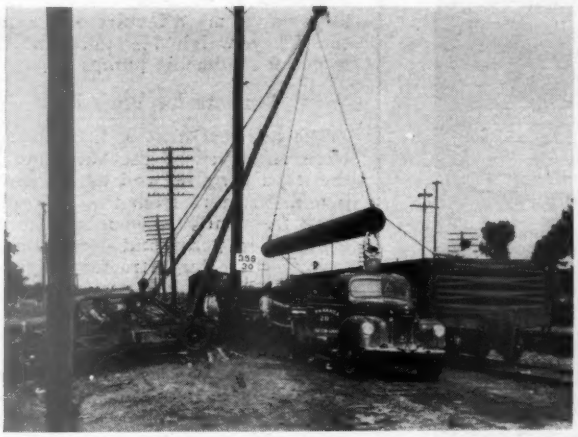
PARKHILL TRUCKS HAVE GONE TO WAR WORK

Hauling Contractors Heavy Equipment on Low-Boy Trailer.

Unloading Pipe with Side Boom on War Emergency Pipe Line Right-of-Way.



Unloading with Crane Truck off Rail Cars to Parkhill Stringing Truck.

Stringing Truck loaded with War Emergency Pipe, showing Roy F. Parkhill, president, and son Joe F. Parkhill.

Parkhill is hauling and stringing approximately half the pipe on the North extension of the War Emergency Pipe Line.

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Bending has been done by the cold method where roll welding was used and by the hot method where stove-piping was used. No trouble is reported due to flattening of the pipe during bending operations; very little trouble was encountered due to buckling of the pipe.

The amount of slack in the line is left largely to the judgment of the inspectors who have had much experience in laying lines for major companies. In hilly country, the bends required by the terrain furnish enough slack. In flat country it is reported that on an average about nine slack wallops or side bends per mile for furnishing slack are normally used.

All of the pipe between Longview and Norris City has been protected. Following welding operations, the pipe is cleaned and covered with a priming coat by a single power-driven unit which goes with each spread. About 2,000 ft. behind this comes the coating-and-wrapping machine which has probably attracted more attention on the part of visitors to the line than any other piece of equipment. Coal-tar enamel coating is applied mechanically and is immediately wrapped with asbestos felt in order to get a bond between the two before the coating cools.

Several devices were used for protecting the coated pipe while it rested on skids. Experience seemed to indicate that a curved plate which fitted snugly under the pipe was more satisfactory than bags of cottonseed hulls. These curved plates were nicknamed "lily pads" when they were first used on the Natural Gas Pipeline Co. of America line.

Oxyacetylene torches were frequently used for drying pipe ahead of coating operations, particularly in bad weather. In laying the eastward extension, drying of the pipe with torches will be extensively used.

A few weeks after construction started, the use of holiday detectors, known as "snitchers," was discontinued. A policy was adopted of putting an additional layer of coating and wrapping over the welds, known as "cigaret wrapping." Bends were also "cigaret wrapped" in the same manner.

Large tractors were hard to obtain because of conflicting demands by other wartime construction. The large tractors were also effective in moving stumps in the clearing of right-of-way.

More than 70 24-in. valves have been planned for the line. The minimum needed for putting the line in operation is 48 24-in. valves. These huge valves are a feature of the project. They weigh 7½ tons and are larger than the big pumps.

Tractors for Back End

The heaviest tractors in the spread were employed at the back end for the dope gang as well as for lowering in. Tractors from the dope gang were frequently moved back to the lowering-in gang and sometimes as many as five large tractors might be used for lowering in at one time, although under usual conditions there might not be more than three.

The great amount of counterbalancing necessary for all tractors except the very largest meant that there was often much trouble with bogging down while working in swamp conditions due to the unbalanced situation when the tractor was not carrying pipe. The better balance of the larger tractors had distinct advantages.

Single lines were laid across all river crossings of pipe of the same wall thickness as the rest of the line. This was necessary because of the impossibility of getting thicker pipe for river conditions.

In the construction of the eastern extension, heavier pipe will be used for river crossings than the pipe used in the rest of the line. In constructing the Texas-Illinois leg, production and traffic requirements were such that it was only practicable to furnish pipe of one wall thickness.

The river-crossing pipe was double-coated and wrapped with flood coat and whitewash to prevent the soil sticking. Pipe at river crossings is laid with a considerable upstream bend as is customary in pipe-line construction, weighted with river clamps

(Continued on Page 102)

Oil Piping
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PIPE COUPLINGS AND FITTINGS
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Key executives of WEP have been drawn largely from major companies. E. Carey Link, traffic manager, formerly of Missouri Pacific Railroad; Harry J. Lingle, purchasing agent of WEP and of Humble Pipe Line Co.; Lloyd D. Witter, treasurer and comptroller; Oscar Wolfe, chief engineer; H. M. Armistead, attorney; Robert E. Harrell, chief right-of-way and claim agent, formerly of Plantation Pipe Line

WEPersonalities

(Continued from Page 54)

J Frank Drake, president, Gulf Oil Corp.; Alexander Fraser, president, Shell Oil Co., Inc.; Ralph W. Gallagher, chairman of board, Standard Oil Co. (New Jersey); B. I. Graves, vice president, Tide Water Associated Oil Co.; Harry T. Klein, vice president, Texas Co.; J. Howard Pew, president, Sun Oil Co.; Harry F. Sinclair, chairman of executive committee, Consolidated Oil Corp., and Robert E. Wilson, president, Pan American Petroleum & Transport Co.

In addition to officials previously mentioned, the following have been concerned, as members of the advisory committee, with plans for the project; W. R. Finney, manager of pipe-line operations, Standard Oil Co. (New Jersey); C. H. Kountz, vice president, Sinclair Refining Co.; L. M. Goldsmith, vice president and chief engineer, Atlantic Refining Co.

A WEP committee concerned with directing operation of the system has been conferring in recent weeks; it consists of H. L. Phillips, president, Sinclair Prairie Oil Co., who is chairman of the committee; C. M. Rosebrugh, chief engineer, pipe-line division, Gulf Refining Co.; J. L. Latimer, manager, Magnolia Pipe Line Co.; and B. E. Hull, vice president and general manager, WEP, and president, Texas Pipe Line Co.

Oscar Wolfe came from position of chief engineer of the Texas Co.'s production department to become the permanent chief engineer of WEP In the solving of the many problems presented by a line of this large

Engineers have been loaned to the staff of WEP by crude-oil and natural-gas systems. Seated: H. V. Johnston, Natural Gas Pipeline Co. of America; Stanley L. Westlake, Ajax Pipe Line Corp.; R. C. Sanders, pipe-line division, Gulf Refining Co.; H. S. Danner, Socony-Vacuum Oil Co., Inc. Standing: Miss Laura Thomas; P. F. Williams, pipe-line division, Gulf Refining Co.; John Rasmussen; W. W. Wood; W. P. Watts; A. S. Munneke, Stanolind Pipe Line Co.; Mrs. Edna Fowler

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PENNSYLVANIA!

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Never Stops a

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SPEED AND DEPENDABILITY are foremost requirements for pipeline contractors entrusted with the job of rushing the War Emergency big-inch pipeline through to the Eastern seaboard—for every day saved brings Victory that much nearer.

THE ENTIRE WHITAKER ORGANIZATION is justly proud of the confidence which WEP, Inc. expressed by awarding this company one of the toughest sections of this final 857-mile extension—across the rock-ribbed mountains and boggy ravines of Pennsylvania.

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OVER 20 YEARS CONTINUOUS PIPE LINE EXPERIENCE

diameter, the project has profited by his experience with engineering of a major pipe-line operations.

Oscar R. Burden, general superintendent, came to the line originally with intention of having supervision of one of the divisions. Within a short time, he found himself shouldered with responsibility for field work throughout the project. He has made a point of visiting all spreads each week. This entailed traveling about 5,000 miles a month.

So great has been the need for having deliveries of material come through on schedule to insure steady progress of the work that Harry C. Lingle, purchasing agent, has had to apply much resourcefulness. In some cases it was necessary to telephone directly to managers of departments of plants making equipment in order to keep track of the status of manufacturing operations. Long experience with major pipe-line purchasing has been of great value in dealing with the intricate problems arising on this WEP project

Lloyd D. Witter treasurer and comptroller, came to WEP from operation of a business of his own in West Texas.

Preparatory to the building of the WEP project valuable work was done in regard to the design of station equipment by Lester M. Goldsmith, vice president and chief engineer, Atlantic Refining Co. R. C. Sanders, engineer, borrowed from the pipe-line division of Gulf Refining Co., had an important part in completing the design of pump stations and other engineering work under the direction of Oscar Wolfe.

E. Carey Link, traffic manager, came from the Missouri Pacific Railroad. In addition to handling shipments of construction material for the project, he will also have charge of the complicated problems connected with moving crude oil and heating oil from the Norris City, Ill., terminal by tank car.

Superintendents of WEP are: O. E. Stimson, D. S. Patton and George F. Brigance.

Stanley L. Westlake, superintendent, Ajax Pipe Line Co., has been making arrangements for terminals in the New York refining area.

J. E. Leazer, division engineer for Northeast Texas, Humble Pipe Line Co., supervised construction for WEP in the Longview, Tex., area.

Completion of the work of laying the largest part of the line ahead of schedule is due to the effort made by contractors' organizations to meet the demands of a national crisis. Contractors engaged in building the Texas-Illinois leg are as follows: Williams Brothers Corp., O. E. Dempsey Construction Co., H. C. Price Co., Anderson Brothers, Oklahoma Contracting Co., C. S. Foreman Co., Ray L. Smith Construction Co., Sheehan Pipe Line

(Continued on Page 99)

NO. 1 OF A SERIES

HOW TUBE-TURN WELDING FITTINGS BENEFIT WAR INDUSTRY

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How Tube-Turn welding fittings speed-up piping installation for war production!

EASIER, FASTER, SAFER WELDING

Tube-Turn fittings require only easy circumferential butt welds—which insure faster, better, safer welding by both veteran and novice operators.

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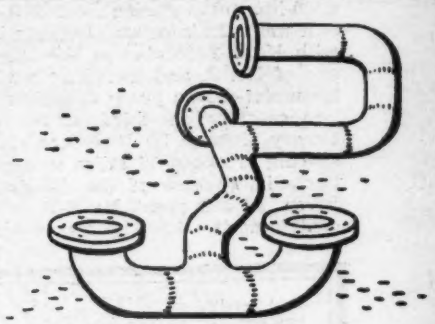
Tube-Turn fittings simplify lining-up operations—because their uniform wall thickness and true circularity permit quick alignment with pipe.



WHOLE SECTIONS CAN BE PRE-ASSEMBLED

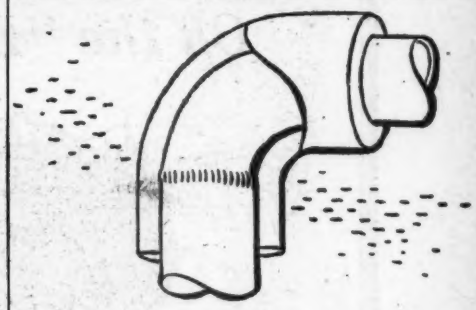
As Tube-Turn fittings and welded joints stand strain and save weight, piping sections can be welded on the ground to save time, then erected.

NO THREADS TO CUT

Welding removes the inefficiencies of threaded joints, plus the labor and time applied to threading. Tube-Turn fittings come ready to install.

NO TORCH CUTTING OR FABRICATION

Since all Tube-Turn fittings are installed with easy-to-make butt welds, they eliminate time-consuming, complicated cutting and fabricating.



FASTER AND EASIER TO INSULATE

Tube-Turn fittings are insulated as readily as the pipe, for the welds form one continuous tube. Eliminating many flanged joints shortens covering time.

FEWER FLANGED JOINTS SPEED ERECTION

Welding fittings supplant the need for many of the flanged joints necessary in screwed piping, which materially reduces over-all erection time.

FEWER HANGERS OR SUPPORTS NEEDED

As welded piping weighs less and stands vibration better than flanged systems, the fewer hangers needed save installation time on these items.

. . And you get stronger, leakproof systems that virtually eliminate piping maintenance or failures that can slow down or paralyze vital war industry!

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TUBE-TURN *Welding Fittings*

TRADE MARK

ARMY E NAVY

Electric Installations

(Continued from Page 66)

No. 9 station, located immediately west of the Mississippi River, sufficient steam boiler capacity was lacking to provide power for a complete 4,500-hp. pump station, so No. 9 station was split into two pump stations, with No. 9-A located at the original site of No. 9, and installing a 1,500-hp. motor-driven pump to deliver full line capacity one-third of the customary distance for level line station spacing or about 17 miles to a point immediately east of the Mississippi River. At this point, No. 9-B station, containing two 1,500-hp. motor-driven pumps, was installed to pump full capacity the remaining two-thirds of the customary distance, or about 34 miles.

Due to the critical shortage of copper, all the power lines, to serve the first 12 pump stations on the original line from Longview, Tex., to Norris City, Ill., were constructed, by orders of the War Production Board, of high-strength steel conductors according to the following specifications:

Specifications call for ½-in. seven wire, high strength, extra galvanized steel strand in accordance with American Society of Testing Materials specifications A-122-141 at ambient temperature, 20° C. This seven-wire strand shall have when carrying 30 amp. at 60 cycles a resistance not to exceed 2.60 ohms per mile and a resistance at equivalent spacing of 18 ft. not to exceed 125 ohms per mile.

While steel conductors had been used to a certain extent in transmitting small amounts of power for rural lines, and in a few cases by power utilities, no one had attempted to transmit as much as 4,500 hp., the amount required at each of the pump stations. Only one manufacturer of steel conductor was able to give sufficient information covering the electrical characteristics, which would enable proper design of the power-transmission lines. Certain guarantees, regarding the resistance and reactance of their steel conductor obtained from this manufacturer, enabled the proper calculation of voltage drops and power losses to be made. Provided the calculated results are proved satisfactorily in actual operation, steel conductors will be used more extensively hereafter.

The accompanying table indicates the approximate station location, the power company supplying the power, total horsepower installed, voltage of supply power lines, and distance from the pump stations to the nearest supply lines.

From the table it can be noted that voltages of the power supply lines vary from 22 kv. to 110 kv. There will be installed 81.9 miles of 110,000-volt power lines, of which 60 miles will be constructed along the pipe-line right-of-way of "H" fixture type, without static wire, with horizontal spacing 14 ft. 6 in. between the phase wires or 18 ft. equivalent spacing. Extra precaution is taken to secure good grounds at each fixture in the case of the power lines erected alongside the pipe line. A total of 66.56 miles of 66,000-volt power lines are necessary to be installed, of which 27 miles is erected along the pipe-line right-of-way, of single-pole double crossarms with static wire and spacing of the three conductors 6 ft., 9 ft., and 11 ft., resulting in equivalent spacing of 8.2 ft.

There will also be a total of 41 miles of 33,000-volt line, and 20 miles of 22,000/25,000-volt power lines constructed, bringing the total to 208.2 for the 26 stations, representing a cost of about $10 per kilowatt of capacity required over the entire pipe line.

Also, it can be noted from the table that 14-in. reduced-voltage and 12-in. full-voltage starting equipments are required for starting the motors in the 26 pump stations. The selection of starting equipment was made in keeping with the power companies' wishes, keeping in mind, however, that the reduced-voltage starting equipments cost almost twice that of the full-voltage starting equipments.

A great amount of interest has also been noticeable in the economies of this project as it will exist upon completion of the entire line.

WHEATLEY'S STREAMLINED STRAINER'S

On the "BIG INCH"

The WHEATLEY STREAMLINED STRAINER is made in sizes from 2" to 30", and for low or high working pressure. Baskets are made in any mesh screen desired.

The Wheatley Streamlined Strainer fits directly into the line, eliminating all drop pressure. The necessity of digging a pit, as is customary when installing the old vertical type, is also eliminated.

The galvanized basket sits on lugs cast in the Strainer Body, allowing ample room all around the basket and end of the Strainer to permit full flow. The Basket is off center to allow reservoir to hold scale and debris.

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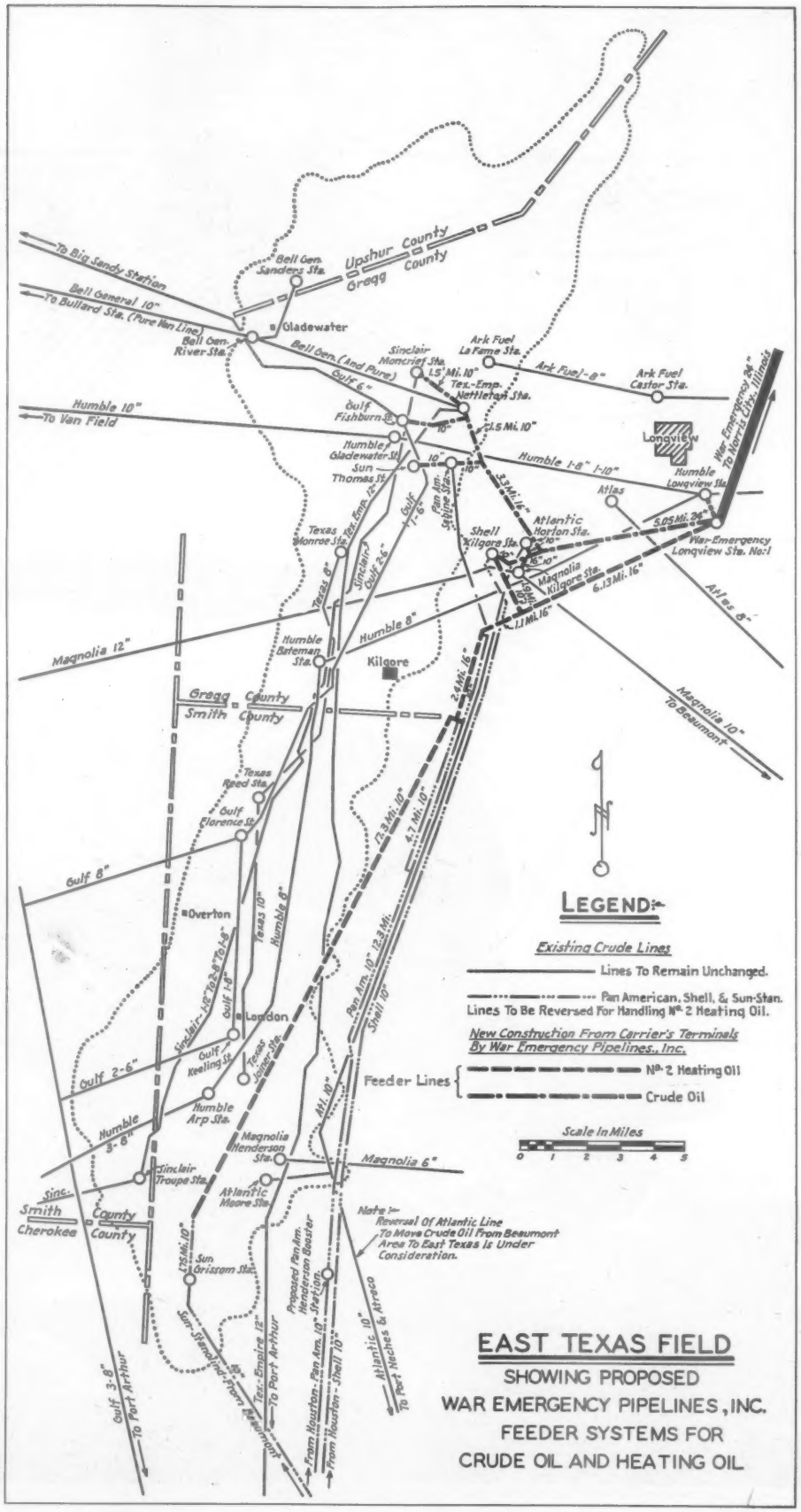
FEEDER SYSTEM

TO arrange for feeding the WEP 24-in. main trunk line at the Longview, Tex., end much planning has been done for the laying of new lines to connect with existing facilities in the East Texas area. Two separate feeder systems have been built. One of these will bring No. 2 heating oil from the three pipe-line systems which are to be reversed and converted from crude-oil service for handling future movements northward from Gulf Coast refineries. The heating-oil feeder system consists of 10-in. branch lines connecting with 30 miles of 16-in. delivering at the WEP Longview terminal. These branch lines are as follows: From Sun-Yount Lee-Stanolind's line, 19 miles; from Pan American's trunk line, 5 miles; from Shell's Kilgore station, nearly 2 miles. Systems of Shell and Pan American are also connected with the WEP crude-oil feeder system to move crude held in storage by these companies.

Crude-Oil Lines

The crude-oil feeder system of WEP consists for the most part of lines of 16-in. and 24-in. pipe fed by networks of 10-in. lines connecting Sinclair's Moncrief station, Gulf's Fishburn station, Texas-Empire-Tidal's Nettleton station, Sun's Thomas station and Pan American's Sabine station, the Kilgore stations of Shell and Magnolia as well as Atlantic's Horton station. The 16-in. line is more than 3 miles long and connects with more than 5 miles of 24-in. delivering to the Longview terminal. Separate from this crude-oil feeder system is the 8-in. line of more than a mile connecting Humble's Longview station with the WEP terminal.



WEPersonalities

(Continued from Page 90)

Construction Co. All of these contractors are engaged in the building of the eastward extension; in addition. the following are also engaged along the route between Illinois and the East Coast: W. A. Bechtel Co., O. C. Whitaker Co., I. C. Little, Exeter Construction Co., Midwestern Engineering & Construction Co., and Jones & Brooks. Stations are being built by Williams Brothers, Midwestern, and Sheehan organizations. Piping for stations was fabricated by H. C. Price Co. at a central yard at Little Rock, Ark.

Stringing Contractors

Unloading, hauling, and stringing of pipe has been divided among motor carriers, among whom the principal ones are: J. L. Cox & Son, C. Hobson Dunn, Roy F. Parkhill Trucking Co., and J. R. Vandaveer.

George C. Bolz Dredging Co. dredged the Mississippi River crossing. C. S. Seal cleared 215 miles of right-of-way through thickly timbered Arkansas country. L. E. Myers Co. built the transmission lines.

Ground surveys have been made by Huey & Cage, Kessler & Bartlett, and Midwestern Engineering & Construction Co. A map of part of the route was prepared by Edgar Tobin Aerial Surveys.

Aerial Photography Used

In the early 1941 stages of planning for the present big-inch line, when the 11 major companies joined to form the National Defense Pipeline group, Aero Exploration Co. of Tulsa was employed to map right-of-way and do other auxiliary service. When final approval for the line was given about a year later it was found that terminal points were changed to such an extent the Aero company was employed to do supplementary work.

This survey was made in four photographic hours. Twelve hours after film was received in the laboratory, prints were ready for engineers' inspection. A strip mosaic map of entire route was made on scale of 1 in. to 1,000 ft., and mounted on cloth in the longest practicable strips, showing a 3-mile width of land over the entire route. The engineers were then able to plot their proposed line right-of-way on this map without leaving the office, thus saving many hours and much expense. After plotting was completed, sectional plats were made and distributed among the various field parties, contractors, and right-of-way buyers.

The work was conducted under the supervision of Fred Q. Casler and later Russell F. Hunt, former presidents, both of whom are now in foreign military service. Theodore N. Law is serving as president.

On the preliminary engineering subcommittee of OPC, in the spring of 1942, concerned with the WEP project of which W. R. Finney was chairman and L. M. Goldsmith was a member, there were: B. K. Morse, Sun-Susquehanna Pipe Line Co.; Clay Briggs, Cities Service Oil Co.; J. R. Manion, Sinclair Refining Co.; C. M. Rosebrugh, Gulf Refining Co.; and J. G. Norton, Magnolia Pipe Line Co.

ACKNOWLEDGMENT

In addition to photographs taken by the staff of The Oil and Gas Journal, this section includes pictures furnished by courtesy of the War Emergency Pipelines, Inc., office, 70 Wall Street, New York City, as well as by A. N. Horne, vice president and assistant manager; Oscar Wolfe, chief engineer; Oscar R. Burden, general superintendent of WEP; Darling Valve Co., General Electric Co., and the Barrett Division, Allied Chemical & Dye Corp.

A large part of the material for the WEP section in this issue was obtained in several trips along the route of the line where there was general knowledge of the principal features of the project among those connected with construction, engineering and equipment organizations.

PIPE LINE SURVEYING

★

When the pipe line industry was called on to build the War Emergency Pipe Line, world's biggest—in record time, Lockwood, Kessler, & Bartlett survey parties went into action. Location surveys totaling 210 miles on the Texas-Illinois Section and approximately 300 miles on the Eastern Extension were completed well ahead of schedule. On the latter project an elevation survey, obtained by barometric leveling, will provide an accurate profile map of the line. Another recent pipe line job surveyed by this organization was the Plantation Pipe Line Company's extension from Greensboro, N. C. to Richmond, Va.

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Below: Yard Coating and Wrapping 18" pipe with Carey Felt for Warren Petroleum Corporation's Crossville, Illinois, Plant. Through the haze of the smoke can be seen the faint outline of American Steel Works Tar Kettles.

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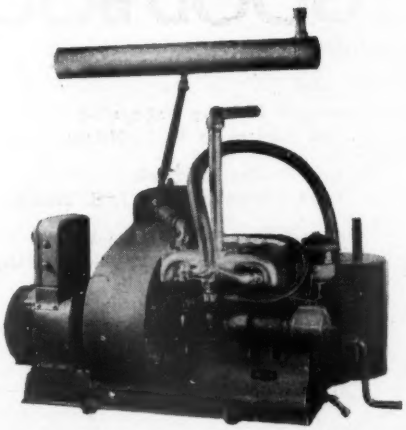

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Interstate Commerce Authority in all States East of Rocky Mountains

Construction Program

(Continued from Page 86)

and water injected into the line. To protect the coating while pipe was dragged into the river, wooden slats were attached.

At one of the large rivers, much blasting had to be done to prepare the trench. Shot holes for blasting were drilled by spudders of a kind used in drilling oil wells in shallow territory. These were mounted on barges. Drilling was done through 8-in. pipe, set on the river bottom. Six-inch pipe was set at the bottom of the shot hole and filled with the specified charge of dynamite. The 6-in. pipe was cut 4 to 5 ft. above the water and loaded with dynamite charges. A section of ditch, 300 or 400 ft. long, extending half across the river, was shot at one time. Shot holes were located at staggered positions along the route of the trench and they were all shot together. When pipe laid at the crossing of the Mississippi River was washed out by a sudden flood at the end of December, the laying of a new line at this crossing became necessary. Later the washed-out pipe will be salvaged.

Pipe at the long river crossings was laid from ramps on barges in the customary manner.

So that starting of the line may not be delayed, a minimum of valves has been called for. Valves are to be installed at the principal river crossings. At a later date an extra line may be laid across some of the principal river crossings, and additional block valves installed then.

Because of the national emergency, special effort was required to push construction as rapidly as possible. In visits to the operations connected with laying pipe along the Texas-Illinois route of the line, two definite impressions have been given: one is of the high efficiency prevailing in the construction organizations; the other is that the line is being laid to be one of the most permanent facilities in the United States.

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THE OIL AND GAS JOURNAL
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JOB DESIGN-

as Applied to the Pumper's Daily Routine

by H. G. Thuesen and M. R. Lohmann**

In this article the authors present a detailed time and cost analysis of the duties involved in the job of a pumper. In it and a succeeding article they reveal how the essential elements of the work can be redesigned to realize more effective performance of the duties, conserve manpower and make possible many economies in operations.

JOBS can be designed for maximum effectiveness on a factual basis in much the same manner that machines and structures are designed. The worth of careful design of machines and buildings has long been recognized yet the rewards to be gained from job designed are frequently much greater since the field is new and unexploited. Labor savings as great as 40 per cent are not an uncommon result of this approach in the oil industry.

Work, when reduced to its fundamentals, is the application of muscular actions during an interval of time. But since both of these components, muscular actions and time, are dynamic and so are not pictured clearly by the human mind, people seldom think of work itself but think of what is accomplished or the result of work. Thus when it is said, "The man uncoupled the pipe," usually only two clear mental pictures are formed, one of the pipe coupled and the other of the pipe uncoupled with only a blur of mental pictures of what happened is between these two end pictures. This blur of pictures is all that the mind normally retains of the muscular actions component. The other component of work, time, is equally difficult for the mind to grasp. This elusiveness of work has caused this important factor of production costs to be slighted.

What Is Design

To design is to project and evaluate ideas. The medium in which the designer is working must be definable and measurable. Thus to design a boiler the stresses must be defined and measured in relation to the material of which the boiler is to be made. In a similar manner the job designer must define the elements of work in terms that are measurable qualitatively and quantitively. The job designer uses specialized systems of representing his ideas comparable to the mechanical drawing and formula of the machine designer. As in machine design so in Job Design the first step is analysis; the whole job must be divided into its parts. Work is composed of many elements each element resulting in some minor accomplishment, the summations of which attain the objections for which the work was undertaken. The simple job of breaking a joint of tubing can be divided into such parts as pick up wrench, snap wrench on tubing, break joint and remove wrench. These parts can be further subdivided into move hand to wrench, grasp wrench, move wrench into position, etc. and these in turn can be still further subdivided. These elements of work or accomplishments are to the job designer what such machine elements as bolts, gears, screw threads and gear teeth are to the machine designer. These job elements are the definable, measurable elements from which all jobs are built.

The degree of subdivision is dictated by the nature of the job being designed. For example it is necessary, for practical results, to use a much finer degree of refinement in the design of a well servicing job than a pumper's job.

What Is Job Design

Job Design is breaking the work of a job into definable and measurable elements as previously illustrated, analyzing these elements for effectiveness in doing work and then reconstructing the job using only effective elements in the proper sequence so that the job can be performed by the worker in the shortest time with the least effort. Or restated, job design consists of determining the essentials and selecting the effective elements for the accomplishment of the essentials. Improvements in the effectiveness of labor utilization are obtained by:

1. Eliminating unnecessary work elements.

2. Substituting effective for ineffective elements.

3. Eliminating periods of enforced idleness.

By testing each element of work of the job against the criteria, "Does it efficiently assist in the accomplishment of the work objective," the ef-

*Department of Industrial Engineering, Oklahoma Agricultural & Mechanical College, Stillwater, Okla.

fective work elements are chosen. These work elements are then arranged in the proper sequence for smooth and uninterrupted performance.

Opinions of workmen and supervisors are essential in analyzing the elements of a job but as it is impossible to measure and test these elements by casual observation, it is necessary to make a detailed time study of the job. A stop watch, more commonly known as a decimal timer, is used with which the duration of the elements of the job can be measured with considerable precision. In some instances, a motion picture camera is of considerable assistance in recording and measuring rapid action in jobs of short duration. Sufficient observations including a detailed record of the elements of the work performed and the time of each element must be made of the job in the field. The length of these observations may vary from hours to days depending on the repetitiveness of the job but sufficient studies should be made so that the observation is representative of the job.

Jobs must be designed by the cooperative efforts of the supervisor, who defines the objectives, and an experienced job designer, who measures the job and designs it around the objectives.

Application of Job Design

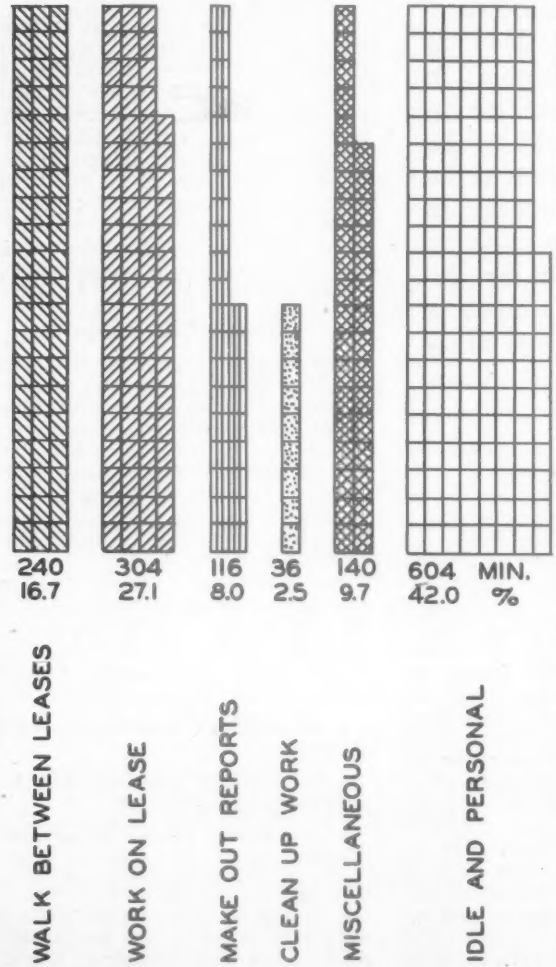
Job design has had successful practical application in well servicing, maintenance, pumping and kindred production occupations in a number of the Southwest's oil fields. Large reduction of labor costs and with correspondingly large reduction of personnel have been the results. A reduction in personnel without a reduction in quality or quantity of operations is doubly important today due to the serious man-power shortage. Production of oil must be carried on with less manpower. Job Design has made this possible in the fields in which it has been applied. To illustrate the application of this new technique, a case example in which pumping jobs are designed with a 55 per cent savings in labor follows:

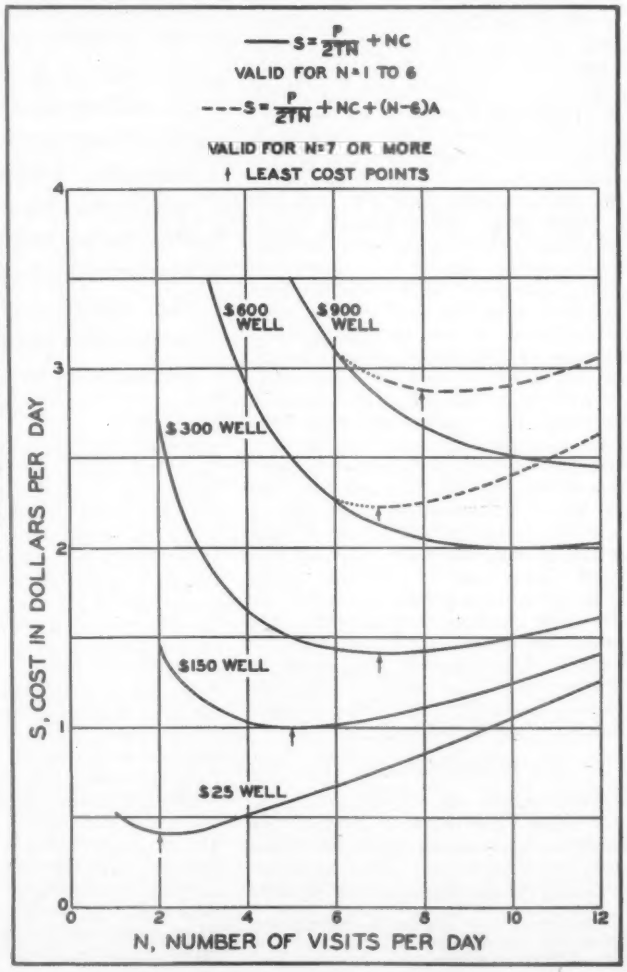
Although this case example covers pumping in one particular field, the fundamentals illustrated as well as the technique of study have also been applied in other fields and in other states and are applicable anywhere.

This field in this case example covers a considerable area in the residential part of a city. There are over 100 wells controlled by one operator in fairly contiguous blocks. The wells, located approximately one per city block, range in production from a few barrels to about 800 bbl. per day. With the exception of a few wells which "pump off," these wells are pumped for maximum production 24 hours per day.

In most instances, each well and its equipment and an area of from one to several lots is surrounded by a substantial fence with gates and locks. These enclosures are kept free from grass, weeds, and rubbish. Practically all wells have individual tank bat-

Fig. 1 (left): Graphic analysis of the daily routine of a pumper (based on observations of a pumper on a nine-well group) showing the number of minutes per 24 hours and percentage of time spent in his various activities. Fig. 2 (right): Curves for determining the number of visits for a minimum cost a pumper can make per day to wells of various productive values





teries. In some cases, batteries are located in the same enclosure with the wells they serve and in others two or more batteries are placed adjacent to one of the wells or in separate enclosures. Multicylinder internal combustion gas engines and beam pumping units are used almost exclusively and for simplicity will be considered to be used exclusively in this discussion.

As it is deemed necessary for a pumper to be on hand 24 hours per day, three pumpers each working 8-hour tours plus the necessary relief to hold to a 40-hour work week were assigned to each 7 to 10 wells which had been considered a pumper group in the field previous to the introduction of Job Design. These men walk from well to well in the performance of their duties.

Gathering Data

The first step in the analysis of the pumper's job is to become thoroughly familiar with his activities on the job. An over-all picture is obtained by discussing the job at some length with the supervisor and the pumper. To get the detailed picture essential for Job Design, an observer records each element of the pumper's activities as he performs his work, noting the elapsed time for each element to the nearest 0.1 minute with the aid of a decimal timer. On each group of wells, each pumper is observed continuously throughout his tour. Thus on a minimum basis, this record will show just what the pumpers on each tour of each group of wells did during each 0.1 minute for at least 24 hours. As will be pointed out later, additional data to even greater detail will be required on some of the pumper's activities.

Fig. 1 shows the results of such observation over a 24-hour period in a well group of nine wells. The job, as it exists, appears to be a confusion of elements when viewed in its entirety. With the data collected, these elements can be classified under the headings (1) walk between leases, (2) work on lease, (3) make out reports, (4) cleanup work, (5) miscellaneous and (6) idle and personal and the percentage of time devoted to each deteremined.

This first breakdown provides an insight into the pumper's job sufficient to determine, with aid of supervision, the essentials of the pumper's job.

The Essentials of a Pumper's Job

For analysis, the objectives for which the pumper is employed may be classified as follows:

1. Detect trouble which would result in damage or loss of production and correct or report same to lease foreman.

2. Service, adjust and make minor repairs to equipment on the lease.

3. Switch, top out and gage tanks, report gages and run oil to the pipe line.

4. Maintain the lease and lease equipment to the desired standard of cleanliness and orderliness.

The first tthree classifications embrace a large percentage of the pumper's activities and most of these are performed during regular visits to the wells. For this reason, it is logical as a first step in the design of the job to determine the economical number of visits to each well.

Economical Number of Visits to Well to Minimize Production Loss

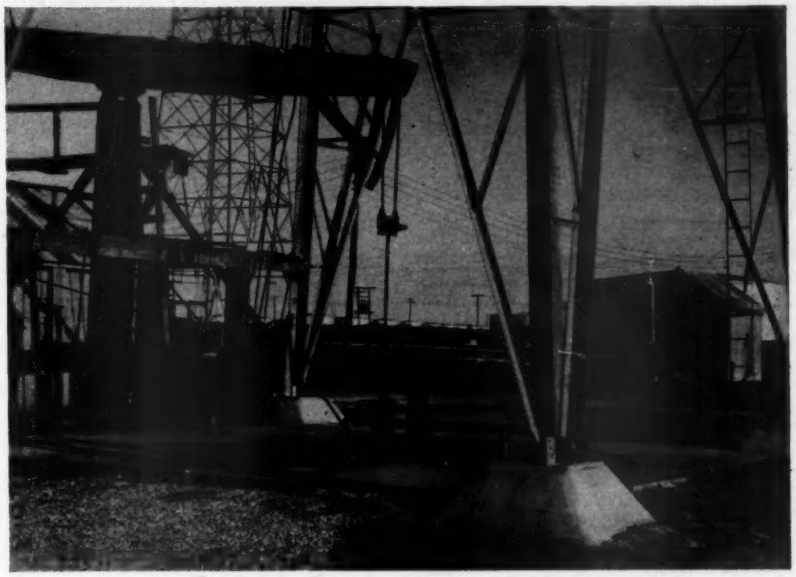
The first classification of activities, **detect trouble which would result in damage or loss of production and correct or report same,** should be performed on the principle that the losses avoided by the visits more than offset the cost of making the visit.

The frequency or the number of visits to the well per 24 hours which can be justified to minimize loss of production from the earlier detection of a well that has done "down" due to failure of either surface or subsurface equipment will now be considered.

Let T = the interval in days between "downs" of the well as shown by the experience record, P = the daily net production of the well in question in dollars per day, N = the rumber of regular visits per well per day at which a "down" well may be detected, and L = the average daily loss in dollars due to loss of production between the time the well goes "down" and this condition is detected.

The dollars of lost production from any one "down" will equal P/2N, the factor 2 in the denominator accounting for the fact that "downs" will, on the average, occur midway between succeeding visits. Since any one "down" will result in an average loss of P/2N and that, on an average, a "down" will occur each T days where T in this field is 30 days, the average daily loss in dollars will be L = P/2TN. Thus, for example, when P = \$150, N = 4 and T = 30 days, L = \$0.625.

Next consider the cost of visiting the wells. Let N = the number of regular visits per well per day as before, and C = the cost in dollars of each regular visit based on the average time required and the pumper's wage rate, and V = the cost per day per well for these regular visits, then V = NC and for N = 4 as before and C = \$0.10 which applies for the area under consideration, V = 4 × \$0.10 = \$0.40. Now let S = the sum of the average daily lost production, L, and the daily cost of the visits, V, then S = L + V = P/2TN + NC. For the values taken above, S = \$150/(2 × 30 × 4) + 4 × \$0.10 = \$1.025. For a particular well, S and N are the only variables and the equation may be plotted for various values of N as in Fig. 2 to determine the number of visits per day for minimum cost. Minimum cost occurs at 5 visits per day for P = \$150, T = 30 days and C = \$10. The values of S for values of N from 2 to 10 are found to be



Example of "good housekeeping" on the part of a pumper in the servicing and maintenance of pumping equipment

N =	2	3	4	5	6	7	8	9	10
S =	\$1.450	\$1.133	\$1.025	\$1.000	\$1.016	\$1.057	\$1.112	\$1.178	\$1.25
(S − \$1) =	\$0.450	\$0.133	\$0.025	\$0.000	\$0.016	\$0.057	\$0.112	\$0.178	\$0.25

It is seen that the minimum value of S, the cost per well per day, is $1 for N = 5 visits per day. The quantity (S — $1) in the table shows the cost per day in deviating from the ideal 5 visits per day. It should be noted that one more or less visit than the optimum N = 5 does not materially increase the cost. Use will be made of this fact in designing the job.

By differentiating the equation $S = P/2TN + NC$ with respect to N and setting this derivative equal to zero and solving for N results in $N = \sqrt{P/2TC}$. This is a general expression for determining, N, the number of visits per day for minimum cost when P, T and C are known. Using T = 30 days and C = $0.10 as before and solving for N, when P, daily net production in dollars ranges from $10 to $800, the results are:

P =	$10	$25	$50	$100	$150	$200	$300	$400	$500	$800
N =	1.3	2.0	2.9	4.1	5	5.8	7.1	8.2	9.2	11.6

Since most of the wells in this case example have a net production between $100 and $300 per day, it appears practical to design the job on the basis of visiting wells netting $100 to $300 six times per day and all wells netting less than $100 per day two or three times per day as required to service their equipment as discussed later. There remains to be determined the number of visits which should be made to the few wells netting over $300 per day. Since the job is to be designed on the basis of visiting the bulk of the wells six times per day, the pumper will be scheduled to make these visits by the route requiring the least time. For visits so made, the cost per visit, C, has been found in this field to average $0.10. Visits above six per day not made on these scheduled routes will entail considerably more walking and consequently be more costly. Data taken in the area under consideration indicate that each such visit will cost $0.20 or $0.10 more than each of the six visits per day found practical for the bulk of the wells.

Let A = the added cost of each such visit above the cost of C = $0.10 for each of the basic six visits, then $S = P/2TN + NC + (N - 6)A$ (See Fig. 2) and by differentiation, $N = \sqrt{P/T(C + A)}$ where N is the most economical number of visits as before. Using T = 30 days, C = $0.10 as before and A = $0.10 and solving for N, when P, daily net production, ranges from $400 to $900, the results are:

P =	$400	$500	$600	$700	$800	$900
N =	5.8	6.5	7.1	7.6	8.2	8.7

Taking advantage of the fact that deviation of one visit from the calculated idea is permissible, wells netting up to $600 per day are included in those to be visited six times per day. Thus the job will be designed on the basis of six visits per day for wells netting $100 to $600, 3 visits for wells netting less than $100 and 9 visits for wells netting more than $600 of which there are very few. This suggests that the dog house for each pumper group of wells be placed adjacent to the largest well in the group.

Frequency of Visits to Service Equipment

The frequency, that is the number of times per day, with which the second classification of duties, **service, adjust and make minor repairs to the equipment on the lease,** should be done depends upon the reliability of the equipment. This equipment, consisting primarily of an engine and a beam pumping unit, has been brought to a high standard of dependability. Normally, it can be depended upon to operate satisfactorily for long periods of time without attention. Two visits per day to add water and oil if needed and to adjust speed should be sufficient though it may be advisable to have a visit made during each tour to fix responsibility where more than one man visits the lease.

Frequency of Visits to Top Out and Switch Tanks and Run Oil

The leases on which there are tank batteries must be visited to perform the third classification of duties, namely, **switch, top out and gage tanks, make report of the gages and run oil to the pipe line.** The practice followed in this field of gaging tanks at the end of each tour so that the gages of the tanks may be passed on to the next pumper coming on duty appears to be sound and dictates one visit to each tank battery for each tour. The duties incident to switch and top out tanks can usually be performed on regular visits. The duties of meet gager and run oil to pipe line must be scheduled outside of the regular visits if the practice of having the pumper witness the measurement of the pipe-line representative is adhered to.

Summary of Visits to Leases

From the preceding analysis, six regular visits per well per day are justified for **detecting trouble which might result in loss of production,** one regular visit per tour or three per day are justified for **servicing and adjusting equipment** and one regular visit per tour or three per day are justified for gaging and switching tanks for the bulk of the wells in the area. Since the purposes for making these regular visits may be combined, that purpose requiring the greatest number will determine the number of regular visits per day to each well.

On the basis of three working tours, the number of visits per well per day will be three for less than $100 wells (unless they pump off in less than 24 hours), six for wells producing between $100 and $600 and perhaps nine for the largest wells in the field.

It appears logical, therefore, to plan pumping operations on the basis of three 8-hour tours and two visits per well per tour making a few exceptions for the smaller and the larger wells.

The example will be continued in next week's article where time allowances for doing the effective elements of the job are determined in detail, and the job designed to meet the essentials with a reduction in manpower of over 50 per cent and labor savings in excess of $40,000.

BOOK REVIEW

A.S.T.M. SPECIFICATIONS FOR STEEL PIPING MATERIALS. American Society for Testing Materials, 260 South Broad Street, Philadelphia. Pa. Price $1.75 each; $1.25 each on orders of from 10 to 39 copies.

For the first time, the American Society for Testing Materials has compiled in one compact volume all of its specifications covering steel piping materials, most of the standards having been developed through the work of Committee A-1 on steel. Ten of the specifications cover boiler superheater and miscellaneous tubes, many of which are incorporated in the A.S.M.E. boiler code and other codes.

The A.S.T.M. steel committee is in close cooperation with the petroleum industry and has carried out important standardization work on still tubes for refinery service and heat-exchanger and condenser tubes, there being five standards for these materials.

To make the publication complete there are five specifications covering castings which are widely used for valves and related materials, four pertain to forgings and fittings, three cover carbon and alloy-steel nuts and bolting material, and for convenience the standard austenite grain size chart (E 19) is embodied in the book.

For convenience all specifications and tests are arranged in numeric order of the serial designation with a table of contents listing the specifications according to the materials covered, that is pipe, bolting, castings and so forth.

To expedite procurement and conserve critical and strategic materials, many A.S.T.M. emergency alternate provisions have been issued in the piping field. These provisions are incorporated as part of this book.

Kansas Drawdown Productivity Tests Cut Well Costs and Equipment Needs

by Neil Williams

Savings to Kansas operators that have been made possible by adoption of the "drawdown" method of determining well productivity are many-fold. The use of smaller pumping equipment, tubing and rods is effecting a major conservation of steel and other critical materials needed in the war efforts.

INTRODUCED several years ago with considerable apprehension as to its merits, the "drawdown" method of determining well productivity (potential) has been adopted almost universally by Kansas operators. Its application has been responsible for or has made possible changes in drilling, well completion and production procedures that have resulted in greatly reduced requirements for equipment and materials, substantial operating economies, and accruing benefits to producing reservoirs.

The drawdown method supplants the physical tests which are based on capacity output over a specified period of time. These may still be used in Kansas if preferred by the majority of operators in a field, and under certain circumstances may be required by the regulatory officials but now are seldom resorted to.

With the drawdown method, the productivity of a well is computed from measurements of the effects of production upon the height of the fluid column in the well. Production at low rates serves equally well as, if not better than, production at high rates in this calculation. In gas-free or pumping wells, characteristic of Kansas, the fluid column standing in the well is the only force within the well retarding movement of oil into the well bore; hence, reduction in height of the fluid column is a function of rate of production and directly proportional to it, if the resulting values of equilibrium fluid height are plotted against their corresponding rates of production, a "drawdown" curve is obtained, which, extrapolated to zero fluid height, yields the theoretical maximum rate of production. The footage difference in height of the fluid column under static conditions and the height at a given rate of production is the drawdown for that rate of production. The slope of the drawdown curve determines the productivity index of the well, which may be considered as gross production per foot of fluid drawdown.

Productivity as determined by this method is the indicated performance of a well at high rates rather than a gage of the actual volume of oil a well can produce. This accounts for some of the unreasonably high "potential" figures often attributed to Kansas pumping wells. However, although the indicated productivity of a well may appear excessive, it serves as a reliable basis for determining the relative importance or rating of wells for the purpose of production allocation.

Small Pumping Units Used

Since the well productivity in drawdown tests is determined at low rates of production there is no occasion for operators to equip their wells to handle more fluid than is to be lifted to obtain allowables in regular production. Because of this Kansas operators have been able to make use of much smaller pumping units, pumps, tubing rods, and lead lines than would be the case when employing physical pumping tests. This in turn has led to reductions in other equipment requirements, and otherwise has made possible substantial economies in operation.

With the almost universal adoption of drawdown tests, small lightweight individual pumping units and jacks

Fig. 1—Portion of the standard form used by the Oil Conservation Division of the Kansas Corporation Commission for the tabulation of data obtained in a "drawdown" test, and computation of well productivity from the data. Data shown are those of a representative "maximum" well recently completed. The three fluid-level points and production rates are plotted on "drawdown" curve (well No. 1) in Fig. 2

"C" STABILIZATION PERIOD—HIGH

No.	Shot time	Joints ~~Pounds~~	Length of stroke 34"	S.P.M. 29
1	8:05 AM	16.1	Total liquid produced	Daily rate liquid
2	9:00 AM	16.1		
3	10:50 AM	16.1	77.51 bbl.	620 bbl.
	Hours		8[a]	11[a]

"B" STABILIZATION PERIOD—INTERMEDIATE

No.	Shot time	Joints ~~Pounds~~	Length of stroke 34"	S.P.M. 21
1	11:10 a	12.9	Total liquid produced	Daily rate liquid
2	1:30 P	12.9		
3	2:10 P	12.9	43.58 bbl.	3.49 bbl.
	Hours		11.15[a]	2.15 P

"A" STABILIZATION PERIOD—LOW

No.	Shot time	Joints ~~Pounds~~	Length of stroke 24"	S.P.M. 13.5
1	2:50 P	10.8	Total liquid produced	Daily rate liquid
2	3:30	10.8		
3	5:40 P	10.8	22.23 bbl.	178 bbl.
	Hours		2.45	5.45 P

EQUIPMENT DATA

Well Depth	3289	Prod. Form. Dept.	3269
Casing Size	4 1/2 OD	Casing Length	3270
Tubing Size	2" EVE	Tubing Length	3251
Type Pump		Plunger Size	1.75
No. of Tubing Joints	104	Ave. Length	31.2
Pump set at	1565		

REMARKS

Gravity 40° x

Acid Treatment Mo rgan ° Gals. 1000

Date of acid Treatment

Load: Oil Bbls., Butane Gals., Others

Last Productivity "M" Swab test

Water—B.S.

Equipment Permanent

"B" Prod. 349 bbl. — "A" F.L. 2932' / —"A" Prod. 178 " — "B" F.L. 2867' = 171 bbl. ÷ 65' = 2.63

"C" Prod. 620 bbl. — "A" F.L. 2932' / —"A" Prod. 178 " — "C" F.L. 2767' = 442 bbl. ÷ 165' = 2.67 / 2 = 5.30 = 2.65 Avg. Index

Avg. Index 2.65 × Form. Depth— 3269 / —"A" Ft. to Fluid— 337 = 2932 "A" Prod. + 178 = 3000+ Barrels

Indicated or Maximum 3000 × —H_2O None 100.00 % / % = 3,000 bbl. Productivity

STATE GAUGER

powered by 4 hp. to 10 hp. engines or motors and costing less than $2,000 have replaced the use of the old style massive rig fronts and powerful oversize pumping units requiring engines ranging in sizes from 50 hp. to 100 hp. that cost from $6,000 to $10,000 and sometimes more. A saving of as much as 12,000 to 14,000 lb. of steel has been made possible in some of these conversions.

To handle increased volumes of fluid in the capacity pumping tests, operators made general use of 3-in. tubing. Now it is the practice to run not larger than 2½-in. tubing, and most operators use only 2-in. tubing. Rod sizes have been reduced from 1-in. and 1¼-in. to ¾-in. Pump sizes have been reduced correspondingly. Such sizes are more than adequate to lift the allowables now permitted. At the same time much smaller lead lines are required, and as much less oil is produced during tests much less lease storage capacity is needed, a substantial saving in tank battery installations.

With the reduction in size of tubing used in the wells it has been possible to run small casing. Instead of 7-in. casing that formerly was run in most wells, 5½-in. casing now is large size. Most operators run only 4½-in. and frequently 4-in. casing. In turn, this has been an incentive for slim-hole drilling, resulting in important economies in drilling. With the smaller holes, savings have been effected by reduced bit sizes. It has been possible to use lighter drill pipe and generally lighter weight and powered rigs. Most of the rigs are of the portable or semi-portable type so that time and costs of moving and setting up have been materially reduced.

As a result of the savings made in the use of smaller and lighter equipment and the economies effected in drilling, completed well costs in Kansas have been reduced from around $30,000 to $35,000 to from $17,000 to $20,000. Of particular importance at this time is the reduced amount of steel and other critical materials that is being used. The fact that Kansas operators had reduced their use of equipment and critical materials to a minimum reacted against them for a time when the oil industry was called upon by the Government to cut its steel use because, already using a minimum of materials, there were few ways of making additional cuts.

Breakage and wear and tear on pumping equipment also have been materially lessened by the drawdown tests as compared with the capacity physical tests. When making physical tests it was the practice, in order to produce the maximum amount of fluid, to push the pumping equipment to the limit. It was customary to use 54-in. strokes and speeds of as much as 44 to 48 s.p.m. Lifting comparatively large volumes of fluid, the loads were great and excessive strains often were imposed on equipment. Rod and tubing breakage was common, as was damage to other equipment. Since drawdown tests are at low production rates speed and length of strokes are considerably less, conforming to normal pumping conditions so that there are no undue loads and strain at any time.

In addition to reducing requirements for equipment and materials and bringing about general economies in operation, drawdown tests are proving a major factor in conservation and increasing ultimate recoveries from reservoirs. By producing wells at low rates during the tests, reservoir equilibrium is disturbed a minimum and less water is pumped. A substantial back pressure is kept on the formation at all times during the test by not pumping the wells down too rapidly or too far. This helps prevent water coning. By holding water production back during tests, water encroachment during regular production of the wells is retarded and water production during the life of the well is kept at a minimum, permitting the lifting of larger percentages of oil. This in turn is a factor in efficient operation of the wells. As less water has to be lifted during the life of a well, the volume of fluid per barrel of oil recovery is greatly lessened and the loads consequently are materially lightened. By this, lifting and equipment maintenance costs are lessened. In this practice the light equipment may never be called upon to lift excessive volumes of fluid.

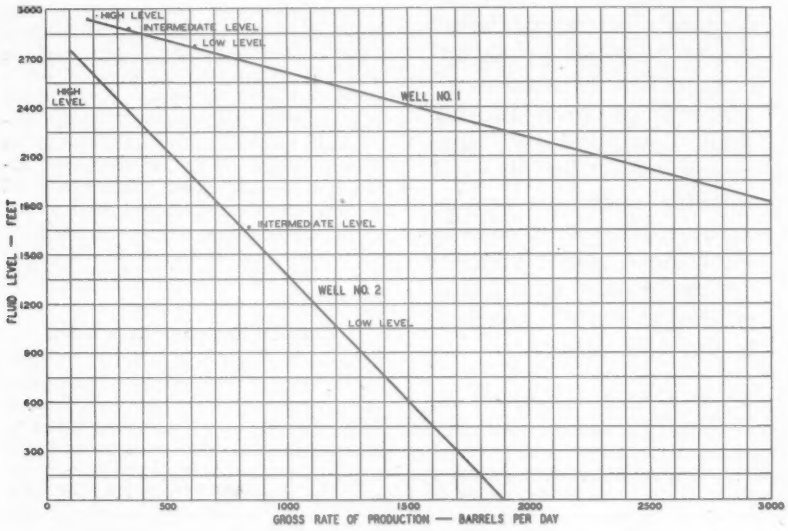


Fig. 2—Representative "drawdown" curves for a "maximum" well (well No. 1) and for a well with productivity of less than 3,000 bbl. (well No. 2). Readings for the latter are: High fluid-level point, 2,540 ft., production rate 200 bbl.; intermediate fluid level, 1,660 ft., production rate 840 bbl.; low fluid level, 1,050 ft., production rate 1,200 bbl.

Removal of Derricks

The reduced maintenance requirements occasioned by the lighter loads has made unnecessary the keeping of derricks on pumping wells. In nearly all instances now derricks are removed upon completion of wells leaving pulling and clean-out jobs for portable units. The removal of derricks is proving a major saving as well as being conservative of steel needed for the war effort.

As the drawdown tests are conducted in Kansas, productivity determinations are based on rates of production at three liquid-level points to insure accuracy. Measurements of fluid level are performed by recording of sound or pressure waves in the annular space of the well. Two types of fluid-level instruments are used. These are essentially alike in principle, except that in one (Echo-Meter), the sound wave is imparted by firing electrically a blank cartridge through a flame arrestor, while in the other (Depthograph) a pressure wave is employed, the latter being created by gas impulses discharged into the well through a quick opening valve. The operation of these instruments is generally known.

The method of computing the well productivity is shown in accompanying charts. Fig. 1 shows the standard form of tabulation and calculation of data used by the Oil Conservation Division of the Kansas State Corporation Commission. Fig. 2 shows the data plotted to give the "drawdown" curve. No well is assigned a productivity of more than 3,000 bbl., hence wells having a productivity in excess of that amount are listed simply as "maximum" wells and receive the maximum allocation of production for their respective fields and classifications under the proration

(Continued on Page 123)

QUESTIONS on TECHNOLOGY

by W. L. Nelson

This department was created for the purpose of aiding managers, superintendents, engineers, chemists and all those engaged in the various phases of plant operation; also those connected with the marketing and utilization of petroleum products. Readers are invited to submit their problems to W. L. Nelson, technical editor. Questions should be submitted in as much detail as possible. Inquiries must be signed, but only the given initials will be printed. The source of the question is considered to be confidential. Questions requiring a discussion of patents, extended computations, or a detailed study cannot be considered. When the matter is of general interest, a reply will be published within a reasonable time.

W. L. NELSON

Value of a High-Octane Blending Stock

In making Ethyl gasoline, I find that 18 per cent of a poly gasoline lowers the TEL requirement from 2.5 to 1.5 cc. I figure that the poly gasoline is worth an extra 1 cent per gallon, whereas certain agencies say it is worth only 0.55 cent extra. I cannot see the latter figure.—B. O. G.

On the basis of 100 gal. of material sold, the two methods of making gasoline may be expressed thus:

Value of 100 gal. using only lead—

$$PG - PEv + (100 - P)(G + x)$$
$$= 82G - 82 \times 2.5 \times 0.18 + 18G + 18x$$
$$= 100G - 36.9 + 18x$$

Value of 100 gal. using poly and lead—

$$100G - 100ev = 100G - 100 \times 1.5 \times 0.18 = 100G - 27$$

in which:

P = per cent regular gasoline used in blend.
G = value of Ethyl gasoline, ct./gal.
e = cc. TEL required for blend.
E = cc. TEL required for regular gasoline.
v = cost of 1 cc. TEL, ct./cc.
x = extra value of poly gasoline over Ethyl gasoline, ct./gal.

When the value by the two methods of making gasoline is the same, the equations are equal to one another:

$$100G - 36.9 + 18x = 100G - 27$$
or $x = 0.55$ ct./gal.
$$\text{or } x = \frac{PE - 100e}{100 - P}(v)$$

However, the equations may be set up on another basis using V to represent the value, in cents per gallon, of the regular gasoline and y as the extra value, in cents per gallon, of the poly gasoline over the value of the regular gasoline:

Cost to make blend = Cost using only lead

$$PV + (100 - P)(V + y) + 100ev = 100V + 100Ev$$
$$y = \frac{100v}{100 - P}(E - e)$$
$$= \frac{18}{100 - 82}(2.5 - 1.5)$$
$$= 1.0$$

Thus, for this particular case, the poly gasoline is worth 0.55 cent per gallon more than Ethyl gasoline and 1 cent per gallon more than regular gasoline.

Gasoline as Fuel in Refineries

Have you any data on the burning of gasoline under stills and boilers as to whether it is more economical to burn the material raw (should it become necessary) as compared with putting same under pressure, i.e. in the old days gasoline was burned in lamps in stores or from underground storage tanks using in each case a hand pump for putting a pressure on the gasoline?—G. F. F.

Gasoline can be burned much as any other liquid fuel except that it is somewhat volatile and should therefore be kept under enough pressure to keep it from vaporizing in the feed line. This is dependent on the temperature in the feed line, running somewhat as follows:

Feed line temp. is 100° F. atm. pres.
Feed line temp. is 150° F. 5 lb. ga. pres.
Feed line temp. is 200° F. 25 lb. ga. pres.

In general it would be wise to maintain a somewhat higher pressure, say from 10 lb. to 40 lb. for the above range of temperature.

The use of air in the burning of so-called "stove gasoline" is not for an altogether uniform purpose. In some such equipments the pressure is applied for the purpose given above, whereas in others, the air pumped into the lamp causes the gasoline to vaporize, and the mixture of air and gasoline vapor goes to the burner as a fuel. The latter method, i.e. aeration of the gasoline, is not advisable or necessary in burning gasoline under stills or boilers. A suitable pressure can easily be maintained on the feed line by means of the fuel pump working against the burner valve.

The heating value of gasoline as compared with other fuels is somewhat as follows:

	B.t.u. per lb. Gross	Net
Gaseous fuels	23,200	21,000
50 A.P.I. gaso. or raw naphtha	20,200	18,800
40 A.P.I. distillate	19,700	18,500
18 A.P.I. st. run black fuel	18,700	17,600
8 A.P.I. cracked residuum	18,000	17,100

Thus, gasoline (and gas) generate somewhat more heat than regular fuel oils, they require somewhat more air for combustion, and they require somewhat higher ignition temperature. Gasoline is intermediate between gases and fuel oil in its combustion characteristics and hence the burners used for burning gasoline are regular oil burners which have been modified toward the design found in gas burners. Thus, the angle of the holes in the burner nozzle should be intermediate between the angles used for heavy oil and for gas burners—i.e. the gasoline should be sprayed outward from the burner nozzle to a greater extent than when burning heavy oils, but not sprayed outward to the degree used in gas burners.

Application of Pipe-Line Efficiency Concept To Gasoline Pipe-Line Calculations

*by Benjamin Miller**

FOR gasoline pipe-line calculations a modified form of the Hazen-Williams water-line formula is frequently used:

$$I = 34.3\, B^{1.85}\, s / C^{1.85}\, d^{4.87} \qquad (1)$$

where:

I is the pressure gradient in lb. per sq. in. per mile.
B is the flow rate in barrels per day.
s is the specific gravity referred to water.
C is the Hazen and Williams coefficient, and
d is the inside diameter of the pipe in inches.

The value of C is often considered a figure of merit for a pipe line—the higher the value of C, the better the line. For example, Norton[1] in a discussion of pipe-line scrapers says "If these scrapers are properly used (and this is a simple matter) we would not be hearing it said that this line or that has a 'C factor of 100-120.' If a line will not give C factors higher than these stated, then something is wrong with that line. From his observations the writer knows that high C factors can be obtained and maintained on so-called closed systems pumping butane and gasoline by the proper use of scrapers." And Smith[2] in a discussion of the use of inhibitor in the Wood River-Lima products line points out that the value of C dropped to 128 for one section as a result of internal corrosion, and that the use of inhibitor and scraping has brought the value of C up to 150-160 in the several sections.

While it is undoubtedly advantageous to have a figure of merit for a gasoline pipe line, the Hazen-Williams C is not the most suitable one. A more appropriate figure of merit is the efficiency of the pipe line.

The expression "pipe-line efficiency" has probably been used more frequently in connection with natural-gas pipe lines than it has in connection with other pipe lines. A quantitative definition was first published by the present author in 1937[3], though an unpublished discussion of the subject had been prepared in 1936.

Efficiency is a word frequently used. Qualitatively, it is used to express nearness to perfection. Quantitatively, efficiency is a ratio—the ratio of the actual to the ideal. Pipe-line efficiency is then the ratio of the delivery of the actual pipe line to that of an ideal pipe line. More precisely, the efficiency of a pipe line is the ratio of the quantity of a particular fluid transported by that pipe line to the quantity of the fluid which would be transported in the same time by a perfect pipe line of the same length and inside diameter with the same inlet and outlet pressures.

*Gas Advisers, Inc., New York.

A formula for the perfect pipe line was discovered by Poiseuille more than a hundred years ago; it is

$$B^* = 23.8\, I\, d^4 / z \qquad (2)$$

where:

B* is the flow rate for a perfect pipe line in barrels per day, and
z is the viscosity of the liquid in centipoises.

Of course, Formula 2 is valid only for viscous flow, that is, for Reynolds numbers not over about 2,000. The Reynolds number is

$$Re = 92.25\, B\, s / d\, z \qquad (3)$$

The delivery of any pipe line in which there is viscous flow will probably be less than would be calculated by Formula 2 because of the resistance to flow offered by joints, bends, fittings, and so forth. We may therefore write

$$B = e\, B^* \qquad (4)$$

where:

e is the efficiency of the pipe line.

Then for any pipe line in which there is viscous flow

$$B = 23.8\, e\, I\, d^4 / z \qquad (5)$$

A formula for turbulent flow in a perfect pipe line was published in 1936[4]; it is

$$B^* = 4.06 (d^5 I/s)^{1/2} (\log d^3 s\, I/z^2 + 4.35) \qquad (6)$$

where:

log means logarithm to the base 10.

Formula 6 is based on a large number of carefully made laboratory experiments, at Reynolds numbers between about 3,000 and about 3,000,000. Flow at Reynolds numbers between 2,000 and 3,000 is unstable, and no formula can be used; however, it is probable that B* will lie between the value given by Formula 2 and that given by Formula 6. For flow at Reynolds numbers above 3,000,000 Formula 6 is applicable as an approximation whose order must await further experiments.

Most gasoline pipe lines operate at Reynolds numbers within the validity range of Formula 6. To determine the efficiency of a gasoline pipe line, therefore, it is necessary only to measure B, calculate B* by Formula 6, and calculate e by Formula 4. Or with B known, e can be calculated by

$$B = 4.06\, e (d^5 I/s)^{1/2} (\log d^3 s\, I/z^2 + 4.35) \qquad (7)$$

Formula 7 may be considered a suggested substitute for Formula 1; while it is proposed here for gasoline lines, it is equally suitable for any liquid, including propane, butane, and crude oil.

Should Be 95 Per Cent

The efficiency of a pipe line cannot exceed 100 per cent. There is no lower limit, but a line in good condition should have an efficiency of 95 per cent under favorable circumstances, while an efficiency under 90 per cent suggests that there is something wrong with the line.

It is possible to use e as a figure of merit to follow the performance of a line, to help decide on the use of scrapers and corrosion inhibitors, or to detect abnormal operations. It is realized that C is being used, but the adoption of e has advantages.

In the first place, the value of C found does not mean anything in itself, because C is just a number. On one hand, there is no single upper limit for C, so that labor and materials may be wasted in trying to get a higher C factor under conditions where a higher C factor is impossible. That cannot happen when e is used, because the efficiency cannot be higher than 100 per cent, and if the efficiency is 95 per cent, there isn't much use trying to raise it. On the other hand, a cleaning job which would increase throughput might be postponed or dispensed with entirely because the C factor seemed satisfactorily high under conditions where a higher C factor is attainable. This also cannot happen when e is used, because an efficiency less than 90 per cent invites attention, while an effi-

ciency under 95 per cent suggests that improvement is possible.

Rea[5] has pointed out that the C factor must be chosen to agree with the product being pumped, low specific gravity and low viscosity going with high C factors, and high specific gravity and high viscosity going with low C factors. He also states that the C factors in several gasoline lines indicates a decrease in C factor with increase in diameter: "Good average values for 4, 6, and 8-in. nominal diameter lines seem to be 140, 135, and 130, respectively. This is contrary to most published data, which shows an increase in 'C' with pipe diameter."

Efficiency Raised by Cleaning

It is of some interest to consider an example given by Rea in which the pressure drop is 846 lb. per sq. in. in 300,000 ft. of line 6.107-in. in diameter carrying 500 bbl. per hour of 65° A.P.I. gasoline whose viscosity is 0.46 centipoise at an average flowing temperature of 60° F. Therefore, B is 12,000; d is 6.107; I is 14.89; s is 0.72; and z is 0.46. The C factor for this line is 134.7, but according to Equation 7 the efficiency is less than 84 per cent. If a C factor of 135 is considered satisfactory for a 6-in. line carrying such gasoline and operating with such a pressure gradient, it is likely that lines thought to be clean are not clean.

It would be reasonable to expect that cleaning a line whose efficiency was less than 84 per cent would increase its efficiency into the 90-95 per cent range. Thus with the same pressure drop an increase of 10 per cent in throughput would appear possible. Raising the delivery from 500 bbl. per hour to 550 bbl. per hour might repay considerable effort expended in cleaning.

Such an increase in throughput would be equivalent to increasing the C factor to about 148. When it is considered that Smith[2] reported C factors between 155 and 160 for one section of the 8-in. Wood River-Lima line, a C factor of 148 does not seem high. Unfortunately for our present purpose, Smith did not include enough data to make possible a calculation of the efficiency of the Wood River-Lima line.

A report that one line is operating with a C factor over 155 might lead operators of other lines to attempt to improve the C factors of their lines to over 155. But a C factor over 155 may not be attainable in all lines, and the attempt to attain it might cause waste. The 6-in. line which has been used as an example with the pressure drop and gasoline mentioned would have an efficiency of 96.3 per cent if its C factor were 155. Thus it is quite unlikely that a C factor over 155 could be attained in this case. Using the pipe-line efficiency concept it is obvious that efforts to get a C factor above 155 would not be worth while. Without this concept the futility of such efforts is not obvious.

To illustrate the variation in C factor which may be expected because of differences in the liquids being carried, consider a 4-in. line (actual i.d., 4.25 in.) operating at a pressure gradient of 20 lb. per sq. in. per mile. At one time it carries propane, of specific gravity 0.51 and viscosity 0.11 centipoise; at another time it carries kerosene, of specific gravity 0.80 and viscosity 2.00 centipoises. The efficiency of the line remains constant at 95 per cent; with propane its C factor is 170, but with kerosene its C factor is only 135.

The variation in C factor due to difference in diameter is not great if the pressure gradient is the same, as in the case of looped lines. For example, if two lines are carrying light gasoline of 0.68 specific gravity and 0.31 centipoise viscosity with a pressure gradient of 30 lb. per sq. in. per mile, and if both lines are 92 per cent efficient, but the inside diameter of one is 4.25 in. and the inside diameter of the other is 8.295 in., the C factor for the 4.25-in. line is 153, while the C factor for the 8.295-in. line is 154.

The variation in C factor due to change in pressure gradient is also not very great. Taking the 4.25-in. line of the previous paragraph, keeping everything but the pressure gradient the same, and increasing the pressure gradient to 50 lb. per sq. in. per mile would increase the C factor from 153 to 154. Decreasing the pressure gradient to 5 lb. per sq. in. per mile would decrease the C factor to 150.

C Factor Measure of Cleanliness

It follows that in the commercial range of gasoline pipe-line sizes and operating pressure gradients the C factor is nearly proportional to the efficiency if only one fluid is being carried by a line. It is therefore possible to use the C factor as a measure of a line's cleanliness, or as a fouling factor, provided the standard chosen is appropriate for the fluid being carried. But the pipe-line efficiency has the advantage of being a number which is a characteristic of the line itself, not of the fluid. And in addition it indicates immediately whether the line is in good condition or not.

It is therefore recommended that Formula 7 be used rather than Formula 1, and that the efficiency of a gasoline line be given rather than its C factor when discussing its ability to transport gasoline.

Of course it is necessary to know or estimate the viscosity of the fluid in order to use Formula 7. But the determination of viscosity is neither difficult nor expensive, particularly when a value accurate only to a few per cent is good enough, as it is for turbulent flow calculations. And if there are no measurements available, the viscosity of gasoline can be estimated from its specific gravity, using the curves given by Rea[5]. Corresponding values are s, 0.74—z, 0.65; s, 0.72—z, 0.46; s, 0.70—z, 0.38; and s, 0.68—z, 0.31.

To paraphrase the remark of Norton[1] quoted above, if the pipe-line efficiency concept is properly used, we will not hear it said that this line or that has a C factor of 100-120. Instead we would have to hear that a line has an efficiency of 60-75 per cent. But the difference would be that a C factor of 100-120 means "something wrong" only to the expert, whereas an efficiency of 60-75 per cent suggests "something wrong" to everybody.

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Kansas Drawdown Tests Cut Well Costs

(Continued from Page 120)

system of the state. The procedure prescribed by the Conservation Division for making the tests follows:

"Three liquid-level points shall be established, in each case after the well has reached equilibrium. . . . Pumping speeds or flowing rates shall be sufficient to establish definite points for the extrapolation of the drawndown curve. The high rate shall be at least 15 bbl. of liquid per hour. The low rate shall be at least 10 bbl. of liquid per hour less than the high rate, and the intermediate rate shall be at least 4 bbl. per hour less than the high rate and at least 4 bbl. per hour more than the low rate. Production gages for each fluid-level determination shall be taken for at least 3 hours for each production rate point after equilibrium has been reached. The drawdown curve shall be a straight line plotted through the lowest production rate point and at a point which is the average of the two higher points established by the test. . . . The straight line shall be extrapolated to indicate the productivity of the well if pumped down to the top of the producing horizon, provided such indicated productivity is less than the maximum permissible productivity hereinbefore prescribed. If such indicated productivity is greater than the prescribed maximum, the value shall not be extrapolated beyond such maximum."

PLANT PRACTICES

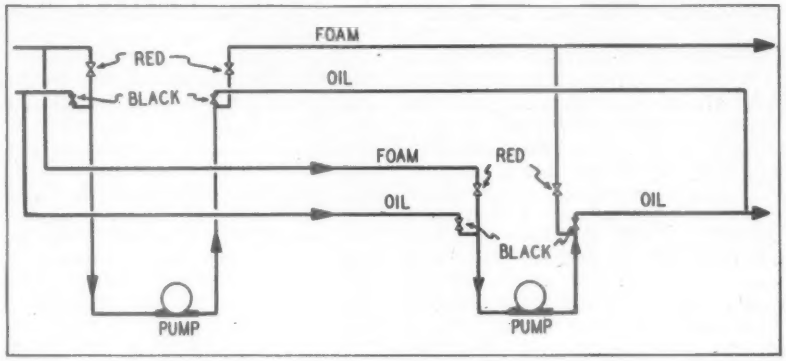
Oil Trap Built From Mist Extractors

THREE old mist extractors, formerly used in a natural-gasoline plant, were made use of in a Texas refinery for the fabrication of a trap to remove oil or condensate from the exhaust steam from pumps in a closed condensate-recovery system. The three extractors were joined end to end and installed vertically on the condensate return line to the water-tube boiler. An outlet was provided in the bottom of each of the extractors from which to drain the oil and condensate, this being run to a sump where it is accumulated for disposal.

Double-Duty Pumps

IN many small and medium-sized refineries, where fire pumps are installed connected with the foaming or other fire-fighting reservoirs, a scarcity of pumps makes it desirable on occasion that the fire pumps, seldom used in a properly safeguarded plant, be used for other emergencies and rush times. For example, in pumping out a tank or reaction chamber where large amounts of oil are maintained, the fire pumps can shorten the time of emptying by aiding the regular pumps in handling the material.

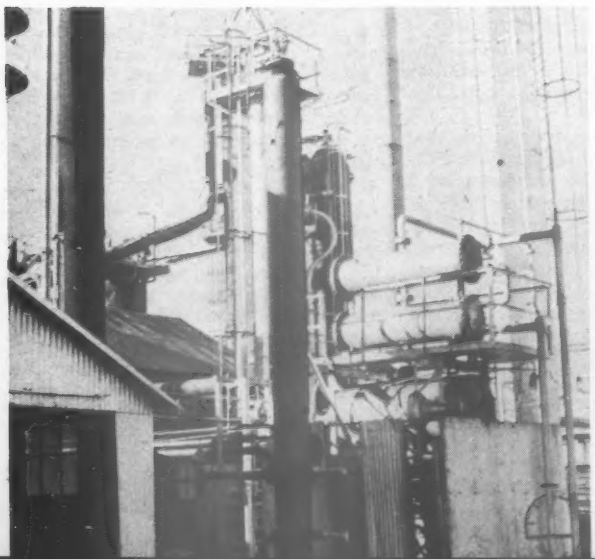
One refinery has installed a double manifold connected with the fire pumps; when the pumps are to be used for fire, the red-painted valves —on foam lines—are opened, and the black-painted valves on oil lines are closed. When the pumps are used for oil handling, the red valves are closed and the black valves opened. A large sign hangs immediately behind the manifold for guidance of workmen.

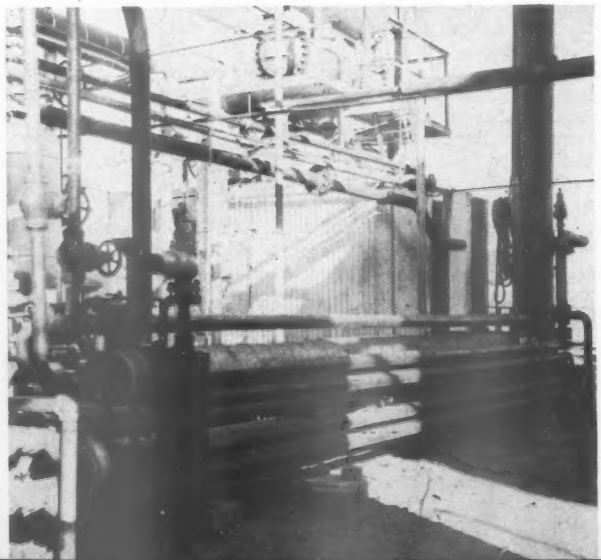


Auxiliary Stabilizer

A WELL-KNOWN refinery (Sunray Oil Co.) needed an auxiliary stabilizer to rectify light vapors from the polymerizer unit. Unable to buy one in the market, such a tower was built from a pipe 18 in. in diameter and 20 ft. long. No 18-in. flange was available for closing the upper end of the tower; an 8-in. flange was available; the upper end of the tower was drawn in to fit this 8-in. flange. At a point 4 ft. from the tower bottom, lugs were welded in to support a grid. The tower was filled with 1-in. clay rings, leaving only space enough at the top to insert the reflux pipe, as the tower was shorter than was desired but must be used.

As a reboiler a two-section G-fin heat-exchanger unit was connected by a 3-in. line to the tower at a point a few inches above the bottom draw-off. Bottom product is withdrawn through this line to the reboiler where it is heated to the required temperature by steam. Heated product returns to the column by a 4-in. line, at a point a few inches below the grid. In this manner a thermo-siphon effect is obtained to circulate the product which flows to the reboiler by gravity and returns, when heated, to the tower. The finished stabilized product is withdrawn from the bottom, the level in the "pot" being governed by a liquid-level control device. The overhead material—butanes and lighter—is returned to the main stabilizer which stabilizes pressure distillate from cracking units.





ANHYDROUS HF---Tomorrow's Refining Process Catalyst

by Arch L. Foster

ANHYDROUS hydrofluoric acid, HF in chemical symbols, offers to the refiner of today and tomorrow a whole bag of tricks for synthesis of several petroleum and petrochemical families of products. Two or three of these families are of major importance to our present war technology: alkylates and the production of hydrocarbon isomers. Others are potentially important in the refining chemistry and petrochemistry of tomorrow, as means for synthesizing both refined products for fuels, lubricants, etc., and intermediates for all sorts of chemicals in the dye, resin, plastic, and other industrial fields.

In the small group of catalysts which promote these several reactions, HF has the advantage of forming very little if any sludge or tarry byproduct to complicate the processes, to reduce its activity and to increase unit down time. In general the recovery of the highly volatile catalyst is simple, a mere matter of vaporization from other materials, of careful fractionation in some cases. HF boils at 67° F., and thus can be separated from butanes, butenes, and butadienes with relative ease in efficient fractionating units, as well as from higher-boiling materials such as hexane (b.p. 146° F.), and higher-boiling hydrocarbons. Separation from pentane (b.p. 96° F.) and its isomer (b.p. 82.5° F.) offers more serious but not insuperable fractionation problems.

Active Life of HF Is Long

HF differs from Friedel-Crafts-type catalysts in that it does not go into any type of permanent or primary combination with the reacting materials, with the exception of minor byproducts such as alkyl fluorides. It is more like the more conventional solid-type inorganic catalysts which do not form primary byproducts and are recoverable by the removal of physical impurities such as carbon and sludge from the used catalyst. In many of its reactions its active life is long; it is recoverable in the main by purely physical means. Such fluorides and addition products as are formed and contain HF or fluorine are generally decomposable by heat and/or treatment with acids, alkalies, or other reactive materials such as alumina, bauxite, and metallic oxides and salts of weak acids. If the reaction forms a difficultly decomposable fluoride from which the fluorine is not practicably recoverable as fluorine or HF, this operation at least serves to purify the product and remove fluorine therefrom. In some cases HF is recoverable from organic fluorides by thermal or catalytic decomposition, as with dehydrohalogenation catalysts, a reaction which reduces catalyst loss and operating costs. While in many technically important reactions the losses of catalyst are not well determined yet, generally the loss especially in low-temperature operations is only a few tenths to a few hundredths of 1 per cent, and is not a serious matter to the operator.

Reactions Catalyzed by HF

HF has been proved to be an efficient catalyst in the following general types of reactions:

1. Alkylation.
2. Isomerization.
3. Condensation.
4. Dehydration.
5. Polymerization.

In all of these reactions it catalyzes with highest efficiency if in the entirely anhydrous state. However, in some cases a considerable percentage of water is permissible, as low as 47 per cent HF being an active catalyst in certain condensation reactions. Electrolysis is necessary to remove the last traces of water, an operation which is not generally required.

Anhydrous hydrofluoric acid has shown some interesting results as catalyst in the promotion of such reactions as alkylation, isomerization, polymerization, condensation, and dehydration. It has the advantages of high volatility, easy recoverability, low product contamination and the formation of little if any tarry or other very undesirable byproducts. In addition to paraffins, olefins, and aromatics other materials such as acids, alcohols, alkyl halides, and ethers may be brought into reaction in alkylation and condensation operations.

In alkylation of hydrocarbons, its action is specific, few byproducts being formed. As in other reactions, polymerization of the olefins used in alkylation is minimized by a large excess of isoparaffin, as low as 3-5 per cent olefin being employed. Isobutane is alkylated with olefins such as propylene and butene to form isoheptanes and isooctanes. This reaction goes at relatively low temperatures, below the boiling point of water and at slightly elevated pressures. Only small amounts of byproducts such as polymers and polyalkylates are formed, little tarry matter found. This situation makes for low losses, high yields, clean recycled stock and equipment which remains free of objectionable amounts of byproducts over long periods. Organic fluorides formed during the reaction may be removed practicably from the reaction effluent simplifying recycle and high ultimate yields.

Reaction in Alkylation

Alkylation of aromatics with aliphatic olefins is an outstanding reaction with HF.

$$\underset{\text{Benzene}}{C_6H_6} + \underset{\text{Propene}}{i\text{—}C_3H_6} = \underset{\text{i-Proply benzene}}{C_6H_5i\text{—}C_3H_7}$$

This reaction may be carried out with olefins, alcohols, alkyl halides, or others. The catalyst is dissolved in the aromatic hydrocarbon, or the isoparaffin in the case of aliphatic reactants, and the olefin, etc., added in smaller ratio, at temperatures as low as 32° F. or even lower. Thus toluene, ethylbenzene, n- and i-propyl benzene and other sidechain aromatics may be produced efficiently. Alkylating saturates or aromatic hydrocarbons with alcohols eliminates a molecule of water from the reaction; catalyst loss and loss of efficiency are greater in this reaction, the water of

reaction diluting the catalyst which has a strong affinity for water. Tertiary, secondary, and primary alcohols react in descending order of ease and yield.

Cycloparaffins, such as cyclohexane and cyclopropane alkylate to form the corresponding n-alkylaromatics or in some cases cycloalkylaromatics. Cyclopropane forms n-propylbenzene and n-propyltoluene, respectively. Ethers form two alkylate molecules with aromatics, with water as by-product.

A similar reaction is carried out with carboxylic acids, acid halides, anhydrides, and esters, to add alkylcarbonyl groups to aromatics. For example, acetophenone, $C_6H_5COCH_3$, (acetylbenzene) is formed with HF as catalyst by treating a dilute solution of HF in benzene with acetyl chloride, eliminating HCl from the products. This reaction is similar to the Friedel-Crafts well-known reaction, in which the alkyl or acylhalides are used; with HF the acid or the anhydride react quite as well as the first two intermediates. Formation of water dilutes the catalyst when acid, anhydride, or ester are used, reducing its efficiency and requiring higher percentages of catalyst.[1]

Addition of Secondary Olefins

Secondary olefins may be added to aromatics to form secondary and tertiary alkylaromatics. As mentioned above, propene adds to benzene to form i-propylbenzene; 5 hours reaction time at 15° C., (59° F.), gives a 75 per cent yield of mono-i-propylbenzene, 17 per cent di-i-propylbenzene.[2] This is a typical reaction, and is a convenient means for adding alkyl, alkoxy, and carboxyl groups to aromatics, also including naphthalene, anthracene, phenanthrene for synthesis of dyes, etc. Similarly, 3-hexene adds to benzene to form the secondary alkylbenzene with an ethyl-butyl sidechain.[3]

Ketones may be formed in fair to good yield by adding acids or their anhydrides, etc., to aromatics as already mentioned. One part butyric acid or butyric anhydride, six parts phenol and two and one-half parts HF give a 40 per cent yield of p-butyrylphenol. Acetic acid gives only a 4 per cent yield of p-acetyltoluene; toluene and acetic anhydride yield 27 per cent of p-acetophenone under the same conditions.[4] This better yield is probably due to the formation of only half as much water with the anhydride as with the acid, resulting in better catalyst activity.

Olefinic alcohols may be used to alkylate aromatics. Allyl alcohol, $CH{=}CHCH_2OH$, adds to benzene by eliminating water, in the presence of HF, to form a styrene homolog.[5] Theoretically, vinyl alcohol, $CH{=}CHOH$, offers a means for preparation of styrene; in practice the first or lowest member of a homologous series shows some differences in reactions as compared to higher members. Methyl alcohol thus differs somewhat from other monohydric alcohols in its reactivities and such may be the case with vinyl alcohol.

With higher olefins such as pentene, various reactions occur when alkylating aromatics.[6] Amylene with benzene and HF gives chiefly polyamylbenzene. Toluene and cyclohexene with HF gives a 75 per cent yield of p-cyclohexyltoluene, which may be dehydrogenated to methyldiphenyl. Cyclo octene gives the same reaction and yield; with octyl alcohol much lower yields result; octyl chloride and bromide show no reaction under these conditions. HF is used as catalyst to effect ring closure of diphenylmethane-2-carboxylic acid, yielding anthrone, 9,10-dihydro-9-keto-anthracene.[7]

Interesting molecular rearrangements may be effected with HF as catalyst. For example, phenylacetate, $C_6H_5{-}O{-}COCH_3$, heated on the steam bath for 24 hours gives p-acetylphenol, displacing one oxygen atom from the carboxyl to form a hydroxy group with the hydrogen of the nucleus in the para position.[8] Aromatic sulfonates when heated with HF at 212° F. show the same rearrangement, forming a phenol sulfonate by transferring an oxygen atom to a hydroxy position.

Other Reactions

Other reactions catalyzed by HF include condensation of aliphatic aldehydes with aromatics, forming mainly simple addition condensation products with high molecular weight, high melting point and infusible resinous materials as by products.[9]

Obviously the refiner's chief interest in HF as a catalyst is in alkylation and isomerization, for the manufacture of improved fuels and intermediates for that purpose. These two reactions in combination with each other and combined with cracking and other processes offer remarkably fine tools for refining in future.

HF Solubility in Octane and in Benzene

Experimental Data

Temp. of soln., °C.	Mole fraction HF in solution — Liquid hydrogen fluoride at —77°C.	—18°C.	0°C	B.P.	Vapor pressure HF	Vapor pressure C_6H_6	Partial pressure of HF over solution, mm. — Liq. hydro. fluoride at —77°C.	—18°C	0°C	B.P.
20	0.0248	0.0385	0.0432	0.0673	768	75.6	4.5	147	203	669.0
30	.0203	.0315	.0355	.0548	1,070	120.2	4.2	137	283	625.0
40	.0158	.0244	.0275	.0422	1,470	183.6	3.8	123	254	561.0
50	.0112	.0173	.0196	.0298	1,990	271.4	3.2	104	214	473.6
60	.0071	.0102	.0117	.0180	2,630	390.1	2.4	77.5	160	354.9
Vap. pr. HF, mm.	5.1	166	342	....	....	....	..	...	...	....
Avg. barometric press, mm.	750	740	742	745	....	....	..	...	...	....

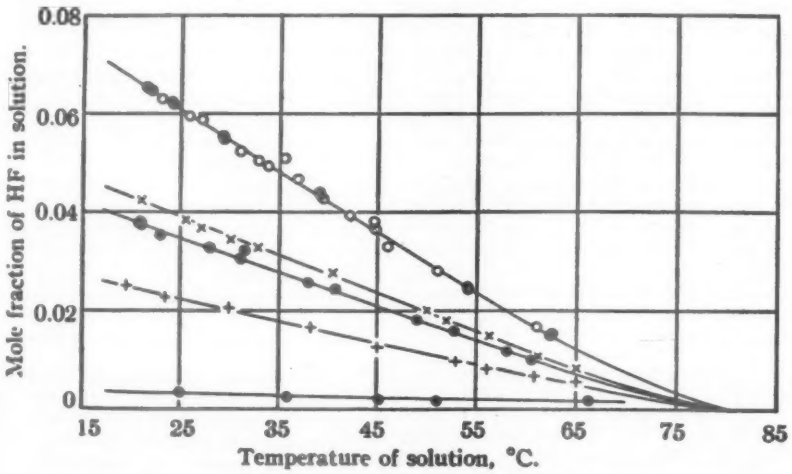


Fig. 1—Solubilities of anhydrous HF in benzene and in octane, at various temperature

○ = solubility in benzene at 19.5° C. (67.1° F.)
× = solubility in benzene at 0° C. (32° F.)
● = solubility in benzene at —18° C. (—0.4° F.)
+ = solubility in benzene at —77° C. (—106.6° F.)
• = solubility in octane at 19.5° C. (67.1°) (bottom)
(From J. Am. Chem. Soc. 53, 86 (1931)

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A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

REDUCED INVESTMENT RESULTS FROM USE OF SMALL CASING

PROBABLY one of the outstanding advances in recent years has been the use of small-bore holes and small sizes of pipe for production strings in oil wells. This has brought about a substantial reduction in the investment required per well, and further reductions may be made.

In many cases it is not fully realized just how much money is involved and how otherwise marginal properties may be turned into profitable ones simply by using smaller equipment. The cost of finished steel per pound is fairly constant and a rough approximation of the savings may be obtained by comparing the weight per foot of the various sizes of pipe being considered. Thus, if one drops from 20-lb., J-55, 7-in. casing to 9.5-lb, 4½-in. casing of the same grade, the delivered price at Odessa, Tex., is cut more than 50 per cent.

For the sake of simplicity, only new seamless pipe of the threaded and coupled type will be considered in this comparison. Other types such as seamless pipe with plain, belled or beveled ends for welding, butt and spiral welded pipe, (threaded, plain, belled, or beveled) and second-hand pipe would produce a different set of figures but the relationship within these classes would remain approximately the same.

It is interesting to note, however, that by going to the smallest size of new pipe, one may complete a well as cheaply as by a larger size of second-hand pipe. Taking the delivered price of 4½-in. casing at Odessa as $0.5468 per foot, it is seen that to obtain second-hand pipe, which has been pulled from a well, inspected, tested, shopped and transported, for a similar amount is almost impossible. Savings in the drilling operation are not included.

The design of a casing pattern is necessarily limited by conditions in the field and by the clearance between the various sizes of pipe. In some fields it is necessary to run an intermediate string of pipe to prevent contamination of a producing zone, because of caves or an incompetent section, and for a number of other reasons and causes. It is also interesting to determine how much money may be used to avoid setting a string of casing by some alternate procedure such as a well-designed and expensive mud treatment. In the following examples, for instance, elimination of the intermediate string could save as much as $5,500 and the least that would be saved would be around $3,500.

TABLE 1

Set'g depth	Pipe O.D.	Pipe Wt.	Pipe Grade	Clearance	Del'd price
400	10¾	35.75	H-40	....	$731.08
3,200	8⅝	32.00	H-40	0.269	5,458.88
4,500	5½	15.00	H-40	1.579	3,428.55
Total					9,618.51
400	10¾	35.75	H-40	....	731.08
3,200	8⅝	32.00	H-40	0.269	5,458.88
4,500	4½	9.5	J-55	2.746	2,464.60
Total					8,654.56
400	10¾	35.75	H-40	....	731.08
3,200	7	20.00	H-40	2.062	3,285.12
4,500	5½	15.00	H-40	0.114	3,428.55
Total					7,444.75
400	9⅝	36.00	H-40	....	774.72
3,200	7	20.00	H-40	0.937	3,285.12
4,500	5½	15.00	H-40	0.114	3,428.55
Total					7,488.39
400	10¾	36.00	H-40	....	731.08
3,200	7	20.00	H-40	2.062	3,285.12
4,500	4½	9.50	J-55	1.281	2,464.60
Total					6,480.80

TABLE 2

400	10¾	35.75	H-40	....	$731.08
4,500	7	24.00	H-40	2.062	5,501.25
Total					6,232.33
400	10¾	35.75	H-40	....	731.08
4,500	7	20.00	J-55	2.062	4,957.20
Total					5,688.28
400	10¾	35.75	H-40	....	731.08
4,500	5½	15.00	H-40	3.763	3,428.55
Total					4,159.63
400	10¾	35.75	H-40	....	731.08
4,500	5½	14.00	J-55	3.763	3,480.75
Total					4,211.83
400	10¾	35.75	H-40	....	731.08
4,500	4½	9.5	J-55	4.930	2,464.60
Total					3,195.68
400	8⅝	28.00	H-40	....	626.44
4,500	5½	15.00	H-40	1.579	3,428.55
Total					4,054.99
400	8⅝	28.00	H-40	....	626.44
4,500	4½	9.50	J-55	2.746	2,464.60
Total					3,091.04
400	7	17.00	H-40	....	357.68
4,500	4½	9.50	J-55	1.381	2,464.60
Total					2,822.28

Theoretically, it is possible to run a particular size pipe inside the next larger one, but in actual field practice it is not done because the clearance between the collars and the outer string of pipe is not great enough. For instance, 7-in. pipe theoretically can be run inside 28-lb.-per-ft. 8⅝-in. pipe, but the clearance would be only 0.032. If this were tried in the field, any number of things could happen to cause a serious fishing job due to the 7-in. casing becoming stuck in the hole. Where a string of casing is being run inside of a short string, the clearance can be less than when it is run inside another long string.

It also should be remembered that when the weight of pipe is increased, the additional wall thickness is placed on the inside of the pipe and consequently the drifted inside diameter becomes less. The 28-lb., 8⅝-in. pipe cited above is the only pipe of the weight and size which theoretically will permit 7-in. casing to be run inside of it.

The casing patterns in Table 1 are for a well in the Permian basin sector of West Texas and show the cost for different methods of equipping. The clearances listed were obtained from the 1942 edition of the Drilling Equipment Directory. In each case surface pipe is set to 400 ft. and the oil string to 4,500 ft. The intermediate string used in Table 1 is run to 3,200 ft.

Examination will show that Cases 3 and 4 in Table 1 are not good possibilities because of the small clearance. Use of 10¾-in. surface pipe with 5½ and 4½-in. oil string (Table 2) would be in cases where it was not known at the start of a well whether an intermediate string would be necessary. Difference between the maximum cost (Table 1, Case 1) and minimum cost (Table 2, Case 8) is $6,796.23. Between the maximum and minimum in Table 1 the difference is $3,137.71, and between the maximum and minimum in Table 2 the difference is $3,410.05.

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REED ROLLER BIT CO.

HOUSTON, TEXAS,

Engineering Fundamentals

No. 62

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

SPECIFIC HEATS OF GASES

THE **specific heat** of a substance may be defined as the ratio of the amount of heat required to raise the temperature of a given weight of the substance 1° F. to the amount of heat required to raise the temperature of an equal weight of water 1° F. Since the amount of heat required to raise the temperature of 1 lb. of water 1° F. is 1 B.t.u., the specific heat of a given substance may be considered as the amount of heat required to raise the temperature of 1 lb. of it 1° F.

The total heat necessary to raise the temperature of a certain quantity of any substance a certain number of degrees Fahrenheit may be calculated by multiplying the number of pounds of the substance times the temperature rise in °F. times the mean specific heat of the substance over the temperature range.

One of the important parts of calculating a heat balance on a boiler or furnace consists of determining the heat loss in the flue gases. This consideration requires, among other things, a knowledge of the specific heats of the gases going out the stack of the boiler or furnace.

It is rather common to express the specific heat of gas as molal specific heat, i.e., the amount of heat required to raise the temperature of 1 mol of the gas 1° F.

The specific heat of a gas is not the same under conditions of constant volume as it is under conditions of constant pressure. For some considerations, it is desirable to use the specific heat at constant volume (usually designated C_v). In other considerations, the specific heat at constant pressure (C_p) must be used. In calculating a boiler heat balance, specific heat at constant pressure is used. In certain calculations, particularly those dealing with compression of gases, the ratio of the specific heats, C_p/C_v, has several applications.

The values given by the equations in Tables 1 and 2 represent the **instantaneous** specific heats, that is, the amount of heat required to raise the temperature of the given substances 1° F. at the given temperature, T. A more useful value in combustion work is **mean** specific heat between two temperature limits. The mean specific heat is obtained by integrating the formula for instantaneous specific heat, thus obtaining the change in heat content of the gas, and then dividing by the temperature change to find the average, or mean.

TABLE 1
Specific Heats of Gases at Constant Pressure*

Gas—	Molal Specific Heat
N_2, O_2, CO, NO, H_2	$6.5 + 0.00055T$
H_2O, H_2S	$8.81 - 0.00105T + 0.000000685T^2$
CO_2, SO_2, N_2O	$7.0 + 0.0039T - 0.000000574T^2$
CH_4	$7.5 + 0.00277T$

(Where T = °F + 460)

TABLE 2
Specific Heats of Gases at Constant Volume (Pressure: 1 Atm.)

Gas—	Molal specific heat
CO_2	$5.544 + 0.00251T - 0.000000317T^2$
O_2	$4.925 + 0.000096T + 0.000000096T^2$
N_2	$4.902 + 0.000126T + 0.000000095T^2$
H_2	$4.628 + 0.000386T$
Air	$4.893 + 0.00095T + 0.000000095T^2$
CO	$4.928 + 0.000095T + 0.000000095T^2$

(Where T = °F. + 460)

Mean molal specific heats (at constant pressure) for gases commonly constituting flue gas are plotted as curves in Fig. 1*.

Example 1

Problem: Calculate the amount of heat required to raise the temperature of 10 mols (288 lb.) of air from 60° F. to 1,600° F.

Solution: From Fig. 1, the mean molal specific heat of air between 60° F. and 1,600° F. is 7.2 B.t.u. per mol per °F.

Then, the amount of heat required is (10) (7.2) (1,600—60), or 110,880 B.t.u.

*From "Fuels and Their Combustion" by Haslam and Russell, McGraw-Hill, 1926.

Example 2

Problem: The air and fuel entering a boiler fire box are at a temperature of 70° F. Calculations using the analyses of the fuel and flue gas show that there are 10.5 mols of flue gas per mol of fuel. The molecular analysis of the flue gas is as follows: CO_2, 10.0 per cent; O_2, 3.4 per cent; N_2, 86.6 per cent. The net heating value of the fuel is 351,100 B.t.u. per mol. Flue gases leave the boiler at a temperature of 750° F.

Calculate the per cent of the net heating value of the fuel that is lost as sensible heat in the flue gases.

Solution: Use 1 mol of fuel as a basis. From Fig. 1, the mean molal specific heats between 70° F. and 750° F. (for all practical purposes, the same as between 60° F. and 750° F.) are as follows:

For CO_2—9.85 B.t.u. per mol per °F.

For O_2 and N_2—6.95 B.t.u. per mol per ° F.

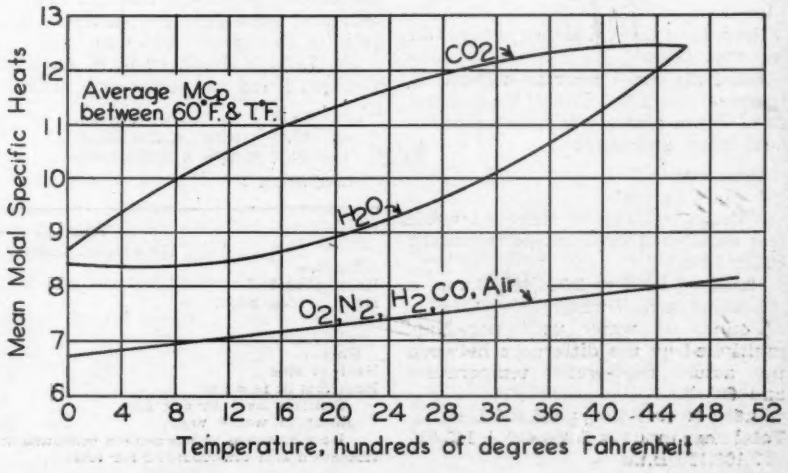
The 10.5 mols of flue gas contains 10.5 × 0.10, or 1.05 mols of CO_2, and 10.5 (0.034 + 0.866), or 9.45 mols of O_2 and N_2.

The sensible heat carried away by the CO_2 per mol of fuel, then, is (1.05) (9.85) (750—70), or 7,031 B.t.u.

The sensible heat carried by the N_2 and O_2 per mol of fuel fired is (9.45) (6.95) (750—70), or 44,662 B.t.u.

Then the total sensible heat carried by the flue gases from 1 mol of fuel is 7,031 + 44,662, or 51,693 B.t.u.

This heat loss is 51,693/351,100 × 100, or 14.72 per cent of the net heating value of the fuel.



Series prepared by Glenn M. Stearns, associate professor of petroleum engineering, University of Oklahoma

A BOILER HEAT BALANCE

THE items that may be placed in a heat balance for a gas-fired boiler are:

Heat input.

1. Heat in the gas. (Based on gross heating value.)
2. Heat in feed water.

Heat output.

1. Heat in steam.
2. Heat loss in flue gases.
   (a) Sensible heat in dry flue gas.
   (b) Heat carried by water vapor formed during combustion.
   (c) Heat loss due to incomplete combustion.
3. Radiation and unaccounted-for losses.

Example

Problem: The following data were recorded during a test of a boiler using natural gas as fuel:

Volume of fuel used, std. cu. ft. per hr.	2,895
Water rate of boiler, lb. per hr.	1,690
Steam pressure, lb. per sq. in., abs.	170
Steam temperature, °F.	485
Flue-gas temperature, °F.	505
Feed-water temperature, °F.	145
Temperature of fuel entering burners, °F.	90
Gross heating value of fuel, B.t.u. per std. cu. ft.	1,024
Standard conditions of gas measurement, lb. per sq. in., abs., and 60° F.	14.7

Fuel analysis, per cent by volume:

	Per cent
CH_4	93.7
C_2H_6	5.3
CO_2	1.0

Flue-gas analysis, per cent by volume:

	Per cent
CO_2	10.0
O_2	3.4
N_2	86.6

Prepare a heat balance based on the data given.

Solution: Use 1 hour as a basis. A temperature of 60° F. will be selected as a datum above which to calculate heat input and output.

Heat input.

1. Heat in fuel.

Volume of fuel in standard cubic feet multiplied by B.t.u. per standard cubic foot,

2,895 × 1,024 = 2,964,480 B.t.u.

2. Heat in feed water.

Pounds of water used per hour multiplied by the difference between the actual feed-water temperature and 60° F.

1,690 × (145-60) = 143,650 B.t.u.

Total heat input = 2,964,480 + 143,650 = 3,108,130 B.t.u.

Heat output.

1. Heat in steam.

From the steam tables (Table 2, Installment 31), it is found that saturated steam at an absolute pressure of 170 lb. per sq. in., abs., has a temperature of 368.4° F. Then the degree of superheat present on this test is (485-368.4), or 116.6° F.

The enthalpy of saturated steam (above a datum of 32° F. on which the steam tables are based) at 170 lb. per sq. in., abs., is 1,196.3 B.t.u. per lb.

The heat of superheat in the steam is calculated by multiplying the degrees of superheat by the mean specific heat of steam which may be obtained from Table 1, Installment 32. Then, the heat of superheat is,

116.6 × 0.582 = 67.9 B.t.u. per lb.

The total heat of the steam (above 32° F. datum) is 1,196.3 + 67.9, or 1,264.2 B.t.u. per lb.

Since the steam tables are based on a datum of 32° F., and these calculations are based on a datum of 60° F., a correction must be made corresponding to the heat of the liquid (from steam tables) at 60° F., namely, 28.1 B.t.u. per lb.

The the heat in each pound of steam above the 60° F. datum is 1,264.2 — 28.1 or 1,236.1 B.t.u. per lb.

The total heat in the steam on an hourly basis is 1,236.1 × 1,690, or 2,089,000 B.t.u.

2. Sensible heat loss in dry flue gases.

One mol of gas at 14.7 lb. per sq. in., abs., and 60° F. will occupy a volume of 379 cu. ft.*

Then, on this test, 2,895/379, or 7.638 mols of gas are burned per hour.

Referring to Part 1 of Example 1 in Installment 61, it was found that with this fuel and flue gas analysis the ratio of flue gas to fuel was 10.53.

So, 7.638 × 10.53, or 80.43 mols of flue gas leave the boiler each hour.

CO_2: 80.43 × 0.1 = 8.043 mols.
O_2: 80.43 × 0.034 = 2.735 mols.
N_2: 80.43 × 0.866 = 69.652 mols.

*Installment 57.

Then the sensible heat loss in the dry flue gases may be obtained as follows (Fig. 1, Installment 62):

In CO_2: 8.043 × 9.5 × (505 — 60) = 34,002 B.t.u.

In O_2 and N_2: (2.735 + 69,652) × 6.85 × (505 — 60) = 220,622 B.t.u.

Total sensible heat loss = 34,002 + 220,622 = 254,624 B.t.u.

3. Heat loss to water vapor formed during combustion.

In Example 3 of Installment 61 it was found that, using the analysis given in this installment, there were 0.193 mols of water formed for each mol of flue gas.

Then, since there are 80.43 mols of flue gas leaving the boiler per hour, the total water formed per hour is 80.43 × 0.193, or 15.52 mols.

From Fig. 1, Installment 62, the mean molal specific heat of water between 60° and 505° F. is read as 5.4 B.t.u. per mol per °F.

Then, the sensible heat in the water formed by combustion is 5.4 × 15.52 × (505 — 60), or 37,295 B.t.u.

Since the gross heating value was used in calculating the heat input, the heat of vaporization of the water must be included as a part of the heat output. The heat of vaporization of water at 60° F. is 1,059 B.t.u. per lb. (Table, Installment 31.) Then this item of heat loss is 15.52 × 18 × 1,059, or 295,842 B.t.u.

The total heat loss to water formed during combustion, then, is 37,295 + 295,842, or 333,137 B.t.u.

4. Heat loss due to incomplete combustion.

None since the flue gas contains nc CO.

5. Radiation and other losses.

The difference between the total heat input and other items of heat output is the radiation and other losses which in this example are 3,108,130 — (2,089,000 + 254,624 + 333,137), or 431,369 B.t.u.

The finished heat balance is tabulated in Table 1.

TABLE 1—Heat Balance

(One hour as basis. 60° F. as temp. datum)

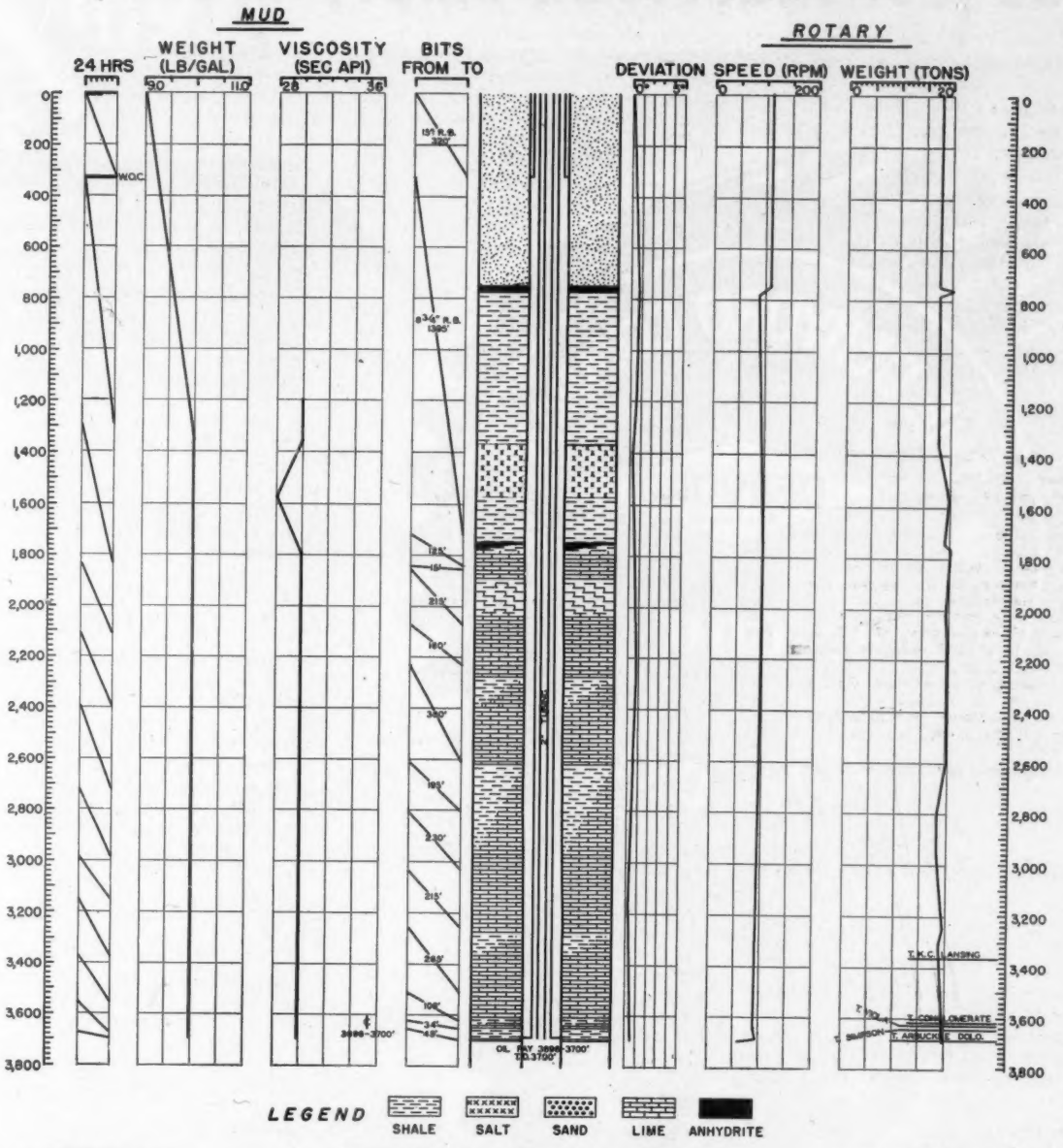
		B.t.u. per hour	Per cent
Input—			
Heat in fuel		2,964,480	95.38
Heat in feed water		143,650	4.62
		3,108,130	100.00
Output—			
Heat in steam		2,089,000	67.21
Heat loss in flue gas		587,761	18.91
Sensible heat in dry gas	254,624 (8.19 per cent)		
Heat in water vapor	333,137 (10.72 per cent)		
Heat loss due to incomplete combustion	(none)		
Radiation and unaccounted for losses		431,369	13.88
		3,108,130	100.00

VICKERS PETROLEUM CO. 1 CURTIS

CSL SW NW 6-22s-13w, Elevation 1,913 ft.

CONTRACTOR
COMPANY TOOLS

Discovery Well, Seward Field, Stafford County, Kansas



DRILLING DATA

Started rigging up rotary rig	10- 2-42
Completed rotary hole and cemented 5½-in. casing	10-15-42
Moved on standard tools and drilled plug to bottom	10-21-42
Completed	10-25-42

Time record for rotary drilling:

Operation—	Hours
Rigging up*	36
Net drilling	159½
Trips (17 round trips)	26½
Running casing and W.O.C.†	81½
Circulating	4
Coring and reaming core hole	5¼
Shut down for repairs, greasing, etc.‡	24½

*Completed rigging up on surface casing cement time.

†Cement time on surface pipe utilized to complete rigging up rotary rig. Cement time on 5½-in. casing utilized to move in and rig up cable tools.

‡Includes time for slope tests.

CASING AND TUBING RECORD

Size (in.)	Weight (lb.)	Length (jts.)	Depth set (ft.)	Cement (sacks)
10¾	32	16	319	250
5½	15	119	3,693	215
2	E.V.E.	...	3,690	...

BIT RECORD

No. bits	Type	Size (in.)
1	Rock bit	15
13	Rock bit	8¾
1*	Corehead	6½

*Hole reamed to 8¾ in. after coring. Cored 3,696-3,700 ft.

COMPLETION DATA

Method of completion Cable tools*
Producing formation.. Arbuckle dolomite
Acid treatment .....3,000 gal.

*Rotary tools replaced with cable tools after cementing 5½-in. casing at 3,693 ft. T.D. 3,700 ft.

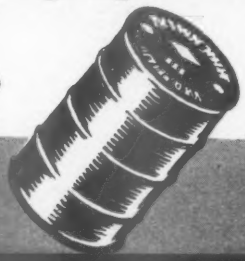
PRODUCTION TESTS

Pumping test:

Method	Drawdown
Productivity indicated	138,465 bbl.†
Gravity of oil	30.6 at 72 F.
Paraffin (grind-out)	5/10 per cent

†For allowable allocation in Kansas all wells with indicated productivity of 3,000 bbl. or more rated as "maximum."

December 6, 1941 – an empty drum was just that...an empty drum.



From December 7th, on through the duration—an empty drum is a vital cog in the machinery of war...

KEEP IT MOVING!

It is to the interest of every member of the oil industry that steel drums be returned to their originating point as soon as they are empty. In the case of Dehydro, as in the case of many commodities used to condition or refine petroleum, it is to the mutual interest of both the manufacturer and the user that these needed containers be kept *on the move.*

The Dehydro Company is devoting every energy to supplying its customers on time ... as ordered. Your cooperation will help us conserve vital steel.

For better dehydrating ... do it the Dehydro Way.

"Dehydro Engineers," in green cars are located in—Great Bend, Hays and Hutchinson, Kansas—Wewoka, Ada, Duncan, Oklahoma City, Healdton and Tulsa, Oklahoma—Kilgore, Brownfield and Wichita Falls, Texas—Tullos and Monroe, Louisiana—Hobbs, New Mexico—Bridgeport, Mt. Vernon and Albion, Illinois.

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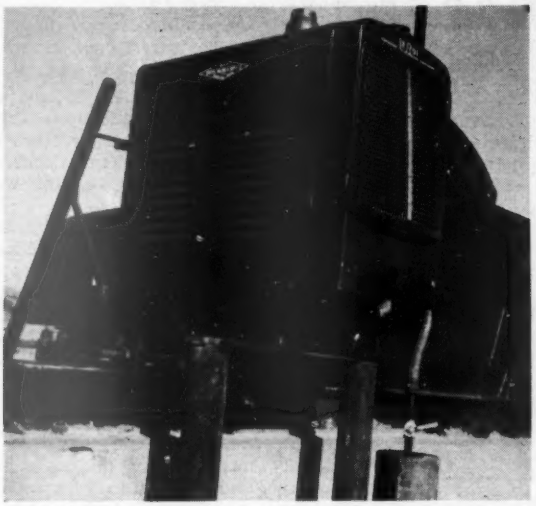
OPERATING IDEAS

Two Standpipes Held By Single Turnbuckle

MANY drilling rigs are now equipped with two standpipes so that a stand-by rotary hose can be kept ready for use when necessary to replace the other. A California contractor has devised an effective means of supporting the two standpipes, securing them firmly to the derrick substructure, and making quick changes in the mud-line connection. The bottoms of the two standpipes rest on the ground side by side. They are held down by means of a common turnbuckle which hooks to the base crossmember of the substructure. A quick-change coupling permits shifting the mud line to either inlet connection.

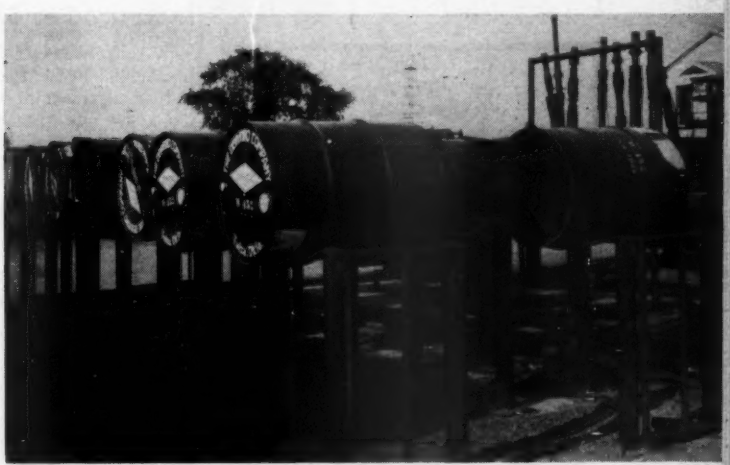


Pipe Legs Support Pumping Engine

AS the concrete base for this pumping installation was not wide enough for the engine which is mounted at the side of the gear box, additional foundations had to be provided to support the engine. Instead of extending the concrete under the engine, two sections of old pipe were set in the ground under the engine to serve as legs. Bottoms were embedded in concrete for rigidity. The engine rests on a plate-metal crossmember welded to the top of the legs.

Central Pipe Rack for Treating Drums

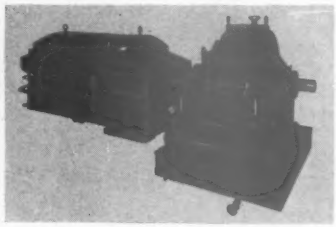
A CENTRAL rack for treating-chemical drums that simplifies handling the drums has been provided by a major producer at its production camp warehouse in the Griffin, Indiana, field. The rack is in two sections, each holding seven drums. It is constructed of reclaimed pipe and rod material. The top is elevated to the height of a truck bed so that a minimum of effort is required in loading and unloading drums. The end of each section has a hinged ramp that rests on the truck bed for handling drums but which hangs out of the way when not in use. Each drum rests on a concave bed that prevents rolling of the drums.



← Working Table for Sucker-Rod Tools

TO save the time and effort consumed in laying down and picking up wrenches from the well floor when coupling or uncoupling rods during pulling jobs, an Oklahoma servicing-unit operator devised a pan that fits around the rods on top of the stuffing box and serves as a table or shelf for the tools. On top the stuffing box, it is at working height, where the tools are always within reach. The pan slips around the rods by means of a small slot from the outside to the center

MURRAY
Steam Turbines for
REFINERIES



Geared condensing unit for large centrifugal pump drive consisting of Type UV turbine and 24" center herringbone reduction gear. View shows lagging for UV turbine, vacuum breaker, center line support and oiling system for gear.

MURRAY IRON WORKS COMPANY
BURLINGTON, IOWA

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REFINING

Inland Refiners Ordered to Increase Yields of Residual Fuel Oil 7 Per Cent Above 1941

WASHINGTON, D. C. — All inland refineries in Districts 2 and 3 west of the Mississippi River have been ordered by the Petroleum Administration for War to increase their production of residual fuel oil by at least 7 per cent on crude above their production during the last 6 months of 1941.

The order was explained as being necessary because of a critical situation in supplies of residual fuel oil in that area, particularly railroad fuel. The refineries may process additional crude above restrictions imposed on them by PAW last November if they increase their percentage yield of residual fuel oil on their total runs and if they do not use additional tank cars except for the transportation of fuel oil. Also, they must not decrease their production of petroleum war products or asphalt.

Complete observation of the order will mean an increase of the residual fuel-oil yield at interior refineries to a total of 28 to 30 per cent of the entire recovery per barrel of crude charged. A reduction of 8 to 10 per cent in the yield of gasoline may reasonably follow with an increase of 1 to 2 per cent in light distillates.

Shell Chemical Contract Increased to $14,000,000

WASHINGTON, D. C.—An increase of $5,000,000 for additional machinery and equipment at the Shell Chemical Co.'s war plant, raising the total commitment to $14,000,000 was announced here last week by Jesse Jones, secretary of commerce. The revised and expanded contract was negotiated between Shell Chemical and Defense Plant Corp., which will retain title to the facilities and pay the operating company a stipulated fee for their operation.

Shell Chemical Co., a subsidiary of Shell Oil Co., Inc., has one of the larger contracts for production of synthetic rubber. The company has one contract for production of 85,000 tons of butadiene in facilities that are scheduled for completion next March.

Lynch Refining Co. Plant At Kilgore, Tex., Is Sold

KILGORE, Tex.—Sale of the Lynch Refining Co. plant at Kilgore to the Sonken-Galamba Supply Co. of Tulsa has been announced by officials of the Lynch company. The plant has been in operation, but was shut down January 1 and offered for sale.

Negotiations are now pending for disposal of the refinery as an operating plant. Included in the plant is a combination topping and cracking unit, a gasoline plant, ethyl plant, boilers, storage facilities, and a 30-mile pipe line gathering system. The plant has crude capacity of 5,000 bbl. daily and a 1,000-bbl. cracking unit.

Rebuilding Started at Pure's Texas Refinery

BEAUMONT, Tex. — A rebuilding program will be started immediately on Pure Oil Co.'s Smith's Bluff refinery which last week suffered extensive damage from explosions and resultant fire. Government agents started an immediate investigation.

Most of the damage, according to reports here, was in the plant's run-down tanks. The Pure refinery is producing a variety of war materials as well as essential civilian products, including aviation gasoline and flexon, one of the synthetic-rubber products.

The entire plant will be shut down until the major units are rehabilitated.

Ashland Building New Aviation-Gasoline Unit

Ashland Oil & Refining Co.'s $2,500,000 expansion program, inaugurated several years ago, includes the installation of an aviation-gasoline unit which is now under construction. The program embraced extensive changes in the refining units of the company as well as changes and additions in other branches. The former included conversion of a unit

to the production of aviation-gasoline blending stock, increased capacity of the distillation unit, revamping the topping unit, expansion of the laboratory, and the addition of much new equipment including a centrifuge unit, continuous kerosene filter, a caustic water washer and increased storage.

Other changes included additions to the marine fleet of two diesel towboats and 11 barges giving the company a fleet of five towboats and 11 barges. All of these units are now assisting in supplying the East Coast area either by bringing in crude oil from Louisiana or in distributing products eastward. The company also increased the number of southern Illinois and western Kentucky wells connected with its pipe-line system by approximately 25 per cent.

Suppliers Encouraged to Bid on Federal Needs

WASHINGTON, D. C.—To encourage more suppliers of petroleum products to bid for federal, state and municipal contracts, the Office of Price Administration last week broadened its pricing provisions governing such transactions.

Under the new provisions a supplier may determine his maximum bidding price by either (1) his own maximum price as determined under the maximum price schedule for petroleum and petroleum products, or (2) the highest maximum price established by the schedule for any competitive bidder for sale of the same products.

In effect, a dealer now may enter any bid he may determine, but the sale may not be made at a price higher than the highest maximum price of any bidder.

Government agencies have found that suppliers of petroleum products whose maximum prices are substantially below those of other parties interested in bidding for government contracts are disinclined to enter the competition. Often this disinclination is due to abnormally low bids at a time when volume and not profit primarily motivated the offer for government business.

When the field of bidders is thus narrowed, the government unit is forced in some instances to purchase from the bidder with the highest maximum price. The result is to increase the price to the state or subdivision.

OPA's provision seeks to remedy such inequities by according to each bidder an equal status in relation to maximum-price regulations. Bids in excess of established maximum prices for the individual dealer shall not be deemed to conflict with provisions of the maximum-price schedule of the product.

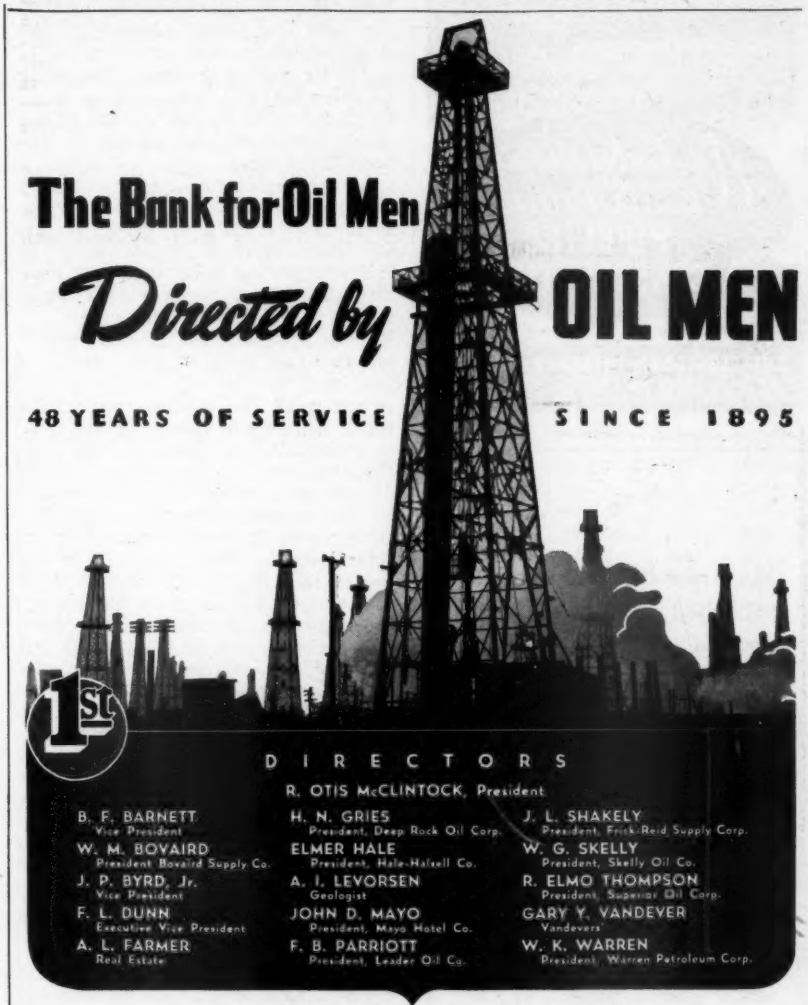
Since participants in such bidding will not be known to one another, it will be impossible for an interested person to determine in advance the maximum price of others. To avoid confusion in this respect and to facilitate the operation of the new provision, the bid as distinguished from the sale itself is permitted to be made without regard to the maximum price established by the schedule.

Copolymer Corp. to Operate Louisiana Rubber Plant

WASHINGTON, D. C.—Rubber Reserve Co. last week announced a contract with the Copolymer Corp. to operate a new government-owned synthetic rubber plant to be built in Louisiana by Defense Plant Corp., a subsidiary of the RFC. The seven independent rubber companies participating in the ownership of the Copolymer Corp. are Armstrong Rubber Co., Dayton Rubber Manufacturing Co., Gates Rubber Co., Lake Shore Tire & Rubber Co., Mansfield Tire & Rubber Co., Pennsylvania Rubber Co., and Sears, Roebuck & Co.

C. M. Hulings, formerly with the American Cyanamid Co., has been appointed vice president and general manager of the new corporation.

The rubber companies interested in this project will also furnish an experienced technical staff for the management of the new plant.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Pipe Lines

First Oil Is Pumped Into WEP 24-In. Line

On the afternoon of December 31, 1942, the first oil was pumped into War Emergency Pipelines, Inc.'s Texas-Illinois line which is now 99 per cent completed. Ahead of the crude oil there is about 75 miles of water for testing the line. The water is preceded and followed by pigs. Fluid is moved by the pumps at the Atlas Pipe Line Co. station in the East Texas area.

At the beginning of this week the line had been tested at 900 to 1,000 lb. as far as the Sulphur River; results had been entirely satisfactory. At this rate testing operations will have progressed well beyond Hope, Ark., by the latter part of this week.

C. S. Foreman Co. is expected to lay the half mile of pipe within a few days which will complete construction of the section across Missouri. Spreads of Ray L. Smith Construction Co. and Sheehan Pipe Line Construction Co. are within 5 miles of each other where they are stymied by wet ground which is so soft that corduroying is useless since tractors sink down to their seats. It is expected that the ground will soon be frozen enough to support equipment.

Completion of the entire project will probably not be delayed by this work or the relaying of the Mississippi River crossing. The most serious obstacle to putting the line in operation is the difficulty in obtaining numerous small items, many of which must come from organizations also engaged in supplying pressing needs of the Army and the Navy. Enough pumps and motors are installed to start operation of the WEP line.

Flood waters have washed out 600 ft. of the 24-in. line crossing of the Mississippi River.

Burt E. Hull, vice president of WEP, reported the damage to Petroleum Administrator Ickes in the following wire:

"Construction Mississippi River crossing was well advanced and completion expected December 30 but river began rising rapidly Monday. Suspended work and all available steel cable and additional anchorage attached to pipe but river rose 15 ft. and rapid current broke several cables and about 600 ft. off free end of pipe at 4 a.m. Tuesday. Apparently no serious damage to barges and other floating equipment. We are diverting to Mississippi River shipments of sufficient amount extra heavy pipe, anchors and other materials now en route other river crossings Indiana and Ohio. Assuming river will fall enough to resume work by January 10. Believe we can install and complete new crossing by January 25 because very deep trench through rock section in river bed is still open and about 400 ft. of pipe and anchorage on west end of crossing is undamaged. Total length crossing 2,600 ft. Will not undertake to salvage materials in present crossing until new crossing is finished. Regrets."

Work was shut down for several days at the end of last month by a labor dispute between two unions as to which one had the right to unload materials at the Norris City, Ill., terminal.

More than 150 miles of right-of-way have been procured along the route of the eastward extension at spots where work is to start soon. Spreads of Oklahoma Contracting, Bechtel and Dempsey as well as the H. C. Price welding crews are in the field and the others are on their way.

A decision has been reached to coat the line with coal-tar enamel and wrap with asbestos felt as far east as the Scioto River, southwest of Columbus, Ohio, as well as all of the pipe east of the Phoenixville, Pa., junction. Pipe at other sections will be coated after a determination has been made of acid conditions in streams affected by coal mines.

Less pipe was laid in more than two weeks following December 15 than was laid in any previous single working day of the project owing to weather.

Tiffin-Akron Products Line Starts Operation

The 82-mile 8-in. products line of Ohio Emergency Pipe Line, Inc. (Defense Plant Corp.) between Tiffin and Akron, Ohio, is commencing operation. This line has been laid to move 15,000 bbl. daily from the Shell and Standard of Ohio lines to the Sun-Susquehanna system.

Completion of the line mitigates the burden that has been thrown on tank cars by the halting of navigation on the Great Lakes because of ice.

Exploration and Drilling

Week's Highlights

THE closing week of the old year saw prospects of a considerable extension of Devonian production in Illinois as the result of a reported 700-bbl. discovery in Christian County, more than 50 miles northwest of the nearest Devonian production, at Louden. This discovery climaxes several years prospecting around the western rim of the deep basin which has resulted in a number of small shows in Montgomery and Bond counties to the southwest but never in noteworthy production.

In addition to the new producing area, Illinois has apparently added another new pay to its already long list in the Chester series. This is the Glen Dean limestone about in the middle of the series. This formation has previously shown small quantities of oil. The test reported last week is in the South Sailor Springs pool which produces mainly from the Tar Springs and Cypress. As these pays are below the Glen Dean, the new pay is not expected to cover a large area.

OKLAHOMA: Oklahoma's first oil well of 1943 extended the Pauls Valley pool ¼ mile to the northeast. A new Hunton lime pool has been opened in Pottawatomie County and a new gas pool has been opened in Sequoyah County. Increasing wildcat activity is indicated (p. 151).

CALIFORNIA: A wildcat in the Mendota section of Madera County failed to show commercial oil production on a formation test and is drilling ahead. A new deep zone in the Del Valle field also failed to flow commercially and a formation test recovered all salt water (p. 142).

SOUTHWEST TEXAS: A new oil pool is in prospect in Karnes County where a wildcat produced oil, mud and salt water on a drill-stem test. Three other wildcats in the Southwest Texas district also showed for pool openers on drill-stem tests (p. 149).

LOUISIANA GULF COAST: Drill-stem tests of a wildcat 3 miles southwest of Krotz Springs, St. Landry Parish, proved that it has opened a new gas and distillate field. A test in Beauregard Parish has recovered sand with good oil and gas odor at two intervals (p. 145).

OHIO: The Wheeling Oriskany field of Guernsey County has been extended ½ mile to the east and another large Clinton sand gas well has been completed in the Brush Creek field, Morgan County (p. 150).

ROCKY MOUNTAIN AREA: Promising wildcats in Wyoming and Colorado failed to show oil on drill-stem tests. The Wyoming test, however, may open a new gas field in the Muddy sand (p. 147).

PERMIAN BASIN: An extension well of the Fullerton pool promises to have the largest potential of any well in the field. It is producing from the Clear Fork lime. An Andrews County well tested 8 bbl. of oil an hour on gas lift (p. 143).

TEXAS GULF COAST: A new oil sand, the Marginulina, has been opened in Jackson County northeast of the Mayo field (p. 145).

EASTERN TEXAS: A deep Travis Peak test is to be drilled on the Bone Hill structure of Shelby County (p. 145).

NORTH CENTRAL TEXAS: Locations have been staked for five new wildcat tests in North Texas counties and a possible new pay zone for the Wynn pool of Clay County has been opened (p. 144).

COMPLETIONS IN ALL FIELDS . . .

(Week Ended January 2, 1943)

	Oil	Gas	Dry	Total	Footage	Comp. to date 1942	Comp. to date 1941
N. Y., Pa., and W. Va.	44	6	1	51	91,035	3,542	5,578
Ohio	1	9	7	17	48,457	1,145	1,541
Indiana	1	1	3	5	10,861	353	466
Kentucky	3	0	1	4	9,650	260	621
Illinois	19	0	15	34	88,943	1,915	3,789
Michigan	5	3	1	9	24,261	689	1,122
Kansas	18	2	12	32	110,865	1,576	1,848
Nebraska	0	0	2	2	4,531	37	45
Missouri, Iowa	0	0	0	0	0	13	37
Oklahoma	5	1	18	24	94,181	1,220	1,832
Texas:							
North Central Texas	2	1	7	10	15,987	1,082	2,797
West Texas	14	2	0	16	74,164	1,296	1,876
Texas Panhandle	7	1	0	8	25,132	352	555
Eastern Texas	4	2	5	11	59,774	407	632
Texas Gulf Coast	8	0	6	14	92,536	695	1,175
Southwest Texas	6	0	11	17	79,621	1,042	2,064
Total Texas	41	6	29	76	347,214	4,874	9,099
North Louisiana	3	0	0	3	11,691	495	677
Louisiana Gulf Coast	5	0	2	7	60,048	467	1,000
Total Louisiana	8	0	2	10	71,739	962	1,677
Arkansas	1	0	0	1	5,912	185	178
Mississippi and Southeast	0	0	0	0	0	79	199
Montana	0	0	0	0	0	208	242
Wyoming	2	0	0	2	10,997	112	186
Colorado, Utah	0	0	0	0	0	26	18
New Mexico	4	0	1	5	17,215	266	605
California	3	0	7	10	26,844	828	1,027
Total United States	155	28	99	282	962,705	18,290	30,090
Total previous week	157	23	117	297			
Week ended Jan. 3, 1942	373	65	116	554			

Secondary Recovery Can Salvage Stripper Well Reserves in Illinois

by Frederick Squires, Walter H. Voskuil,* and Alfred H. Bell**

THE record of the old fields of Illinois for the past 37 years indicates that a substantial part of the total production came from wells whose daily production was so low that they yielded only a small margin of profit. Such wells are now known as "stripper" wells. The normal history of an Illinois oil well is that it is a "flush" producer for a relatively short time, a few months or a very few years at the most. Then for the rest of its life, which may be several decades, it is in the "stripper" class.

It is difficult to define a stripper well precisely. Even if an acceptable definition in terms of rate of return be adopted, the application of this definition to Illinois fields which comprise some 24,000 producing wells would be a large task. For the purpose of this paper a stripper well is arbitrarily defined as one producing less than 10 bbl. per day.

If this definition of a stripper well is accepted, then essentially all the wells in the old Illinois fields fall into this class along with almost a third of those in the new fields discovered since 1936. Furthermore, decline curves for the new pools indicate that the remaining two-thirds will probably be in the stripper class within 3 years. In other words, it is probable that all the wells now drilled in Illinois will be strippers before the end of the war.

As there is no guarantee of new production from wildcat wells, the old production is all that we can count on at a time when an assured supply is vital. The stripper wells in Illinois are favorably located with reference to transportation facilities and refineries, as shown by a glance at the State Highway map and the Illinois oil and gas map which also shows pipe lines, waterways, and railroads.

Stripper wells produce from all the Illinois oil-producing formations, which range in depth from a few hundred to 4,500 ft., with an approximate average depth of 1,000 ft. for the old fields and 2,500 ft. for the new. For specific information as to the depth of producing formations and pools the reader is directed to the state Geological Survey's monthly oil and gas drilling report.

If, during the war, it is essential that refineries operate at full capacity, it is essential that adequate supplies of crude oil are available at all times. Since the oil transportation facilities of the nation—pipe lines, tank cars, and tankers—are overtaxed in an effort to supply the war needs on the Atlantic seaboard and in the Pacific Northwest, not to mention other critical areas, it is essential that resources near refineries be fully utilized. The stripper well must, in this case, be considered as a backlog of assured production during the intervals between new discoveries with flush production. A policy of their continuance must not be based altogether upon the prices determined by larger production, or strictly on a basis of allocation of steel or other necessary producing equipment.

The continuance of a stripper well in the immediate locality of a refinery may mean just that much oil added to the supply when a large producer far from a refinery becomes less effective in maintaining a flow of crude to the refinery, simply because of the critical transportation situation.

It is noteworthy that in addition to the butane from natural gas produced in Illinois, a large quantity of butane is also available from the cracking of crude oil at refineries already equipped for this process. Illinois is therefore a natural location for the manufacture of butadiene for synthetic rubber.

Gas Repressuring

Only through secondary recovery can declining production in stripper pools be arrested and changed to increased production. That this can be done is proved by results already obtained in Illinois.

The first successful repressuring operation in Illinois was carried out on the Mumford farm, 26-10n-14w, Clark County, in 1921. Between 1921 and 1932 the practice was considerably extended, especially in Clark and Crawford counties.

A systematic investigation of repressuring Illinois oil sands was undertaken in 1932, and the results were published in Illinois Petroleum No. 23. Since that time, additional acreage has been repressured with results which are in line with the average results found by the survey.

In 1932 repressuring had been tried in the southeastern oil fields on 107 leases, 77 of which yielded increased recovery for 1 year or more. The repressured leases had a total area of 11,049 acres by complete farms, of which 3,488 acres had been affected by repressuring.

*Petroleum engineer, mineral economist, and geologist, respectively, Illinois State Geological Survey.

This paper is revised and expanded from a statement on "Stripper Well Production in Illinois" furnished to the research and coordinating committee of the Interstate Oil Compact Commission for its meeting in Oklahoma City, Dec. 18 and 19, 1942. Published with the permission of the chief, Illinois State Geological Survey.

DAILY AVERAGE PRODUCTION FOR WEEK

	Jan. 2 crude oil	Jan. OPC quota all oils	Dec. 26 crude oil
Arkansas	75,000	78,300	73,350
California	774,950	815,000	775,250
Colorado	6,660	7,000	6,680
Eastern fields	87,200	107,600	91,100
Illinois	247,000	272,600	246,300
Indiana	15,000	17,200	16,300
Kansas	288,350	310,000	295,900
Louisiana	316,150	347,500	316,800
North Louisiana	*93,150*	.....	*92,600*
Louisiana Gulf Coast	*223,000*	.....	*224,200*
Michigan	59,300	63,700	59,800
Mississippi	56,850	50,000	56,550
Montana	21,805	24,700	22,910
Nebraska	2,900	3,400	3,000
New Mexico	99,100	105,300	95,600
Oklahoma	354,000	400,600	354,850
Texas	1,376,350	1,426,800	1,388,425
East Texas	*350,600*	.....	*358,000*
West Texas	*206,750*	.....	*208,975*
North Central Texas	*138,600*	.....	*140,100*
East Central Texas	*101,300*	.....	*101,200*
Texas Panhandle	*90,500*	.....	*94,200*
Texas Gulf Coast	*421,550*	.....	*418,650*
Southwest Texas	*67,050*	.....	*67,300*
Wyoming	89,240	94,500	93,950
Total United States	3,869,855	4,124,200	3,896,765
Total production Jan. 1-Jan. 2, 1943			7,739,710 bbl.
Same period last year			8,059,400 bbl.

Out of the 3,488 acres increases in production for 1 year or more were obtained on 2,548 acres or 73 per cent. The total number of input wells was 126, of which 93 were on leases which showed increased production. Out of 613 pumping wells, 458 or 75 per cent showed increased production.

The daily average production of the 458 wells, which was 0.73 bbl. before repressuring, was increased to 1.21 bbl. for an average period of 5½ years, or an increase of 66 per cent. These wells have produced 1,111,392 bbl. of oil as against a production of 668,440 bbl., which would have been the total production for a similar period of time at the rate before repressuring was applied, so that the difference of 442,952 bbl. may be credited to the process.

The greatest percentage of increase in oil production due to repressuring was obtained in the Robinson sand in Crawford County. Numerous leases have been repressured for periods as long as 8 to 10 years, and the average rate of production during this long period has been held above the rate previous to repressuring. The average volume of air or gas used per barrel of increased production from this sand was 8,000 cu. ft.

Success in the Robinson sand augurs well for extension of repressuring to the very similar Bridgeport sand in Lawrence County, which covers 6,000 acres and has not been tested as yet.

One repressured lease producing from the Biehl sand in the Allendale field, Wabash County, gave 57 per cent increased recovery for a 3-year period. Other plants installed on this sand since also have been successful. The average volume of air or gas required per barrel of increased oil production has been low, as have been the pressures required.

For the Casey sand in Clark County the oil recoveries have been less, and the volumes of air or gas required have been nearly double the Robinson sand figures.

Repressuring would be an obvious procedure in this emergency were it not for lack of necessary steel, especially for engines, compressors, and pumps. No doubt with the rubber shortage many large size automobile engines, some of which are already in the field, will be available for oilfield power. There is an acute shortage of compressors and pumps. Compressors now in use in small natural-gasoline plants in the southeastern Illinois field might be adapted for use in repressuring with a minimum requirement of additional steel. Efforts are being made to substitute nonmetallic pipe for steel casing and surface pipe. A higher price for crude would encourage these operations. Illinois operators have often been wasteful of natural reservoir energy, which has left a great amount of oil in the sands; part of this can be recovered by artificial means.

Water Flooding

Interest in the water flooding of Illinois sands was aroused by observation of the results of natural and accidental floods at many places and in many different sands, and by the unusually large returns from those pools which produced oil accompanied by a large volume of water.

It has been found that accidental floods have produced more than 400,000 bbl. of oil up to 1936, and edgewater encroachment in such formations as the McClosky has produced very much larger amounts. A tabulated list of these results of accidental floods is given in the table.

A practical application of the lesson has been made on the Biehl sand at Allendale where intentional flooding has been practiced on five properties with considerable success. One firm is still producing many times its previous amount of oil after 6 years of flooding.

Siggins and Parker Applied Floods

Recently applied floods have been developed in the Siggins and Parker pools. Forty acres of Christman Brothers farm in 13-10n-10e, Cumberland County, Illinois, and 60 acres in 21-11n-14w, Parker Township, Clark County, have been drilled up and prepared for intensive flooding by the Forest Producing Co. of Bradford, Pa. The depth of the producing sands in the field ranges from 465 to 600 ft. on one farm and from 230 to 350 ft. on the other. The pattern chosen was the five spot, with five input wells drilled on each line enclosing the Siggins

(Continued on Page 147)

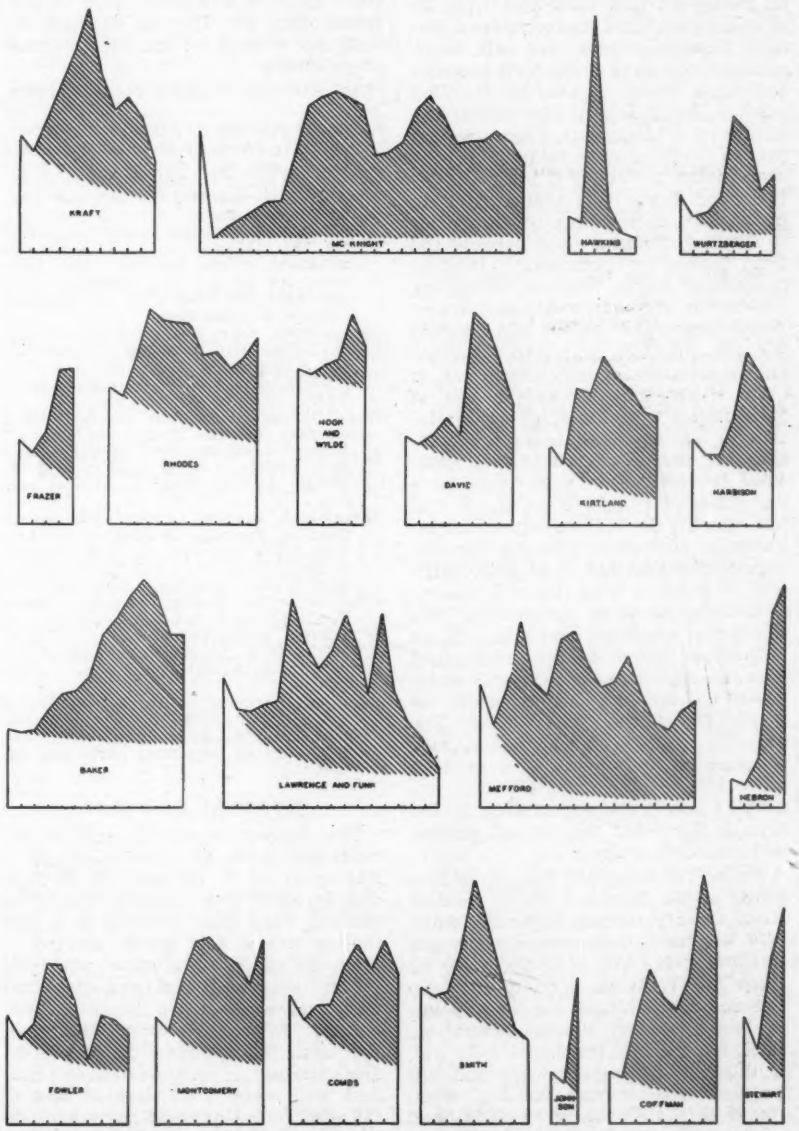

Fig. 1—Production graphs of accidental floods. Time in years, horizontal; annual production, vertical (scales vary). Shaded areas represent production due to flooding

CALIFORNIA

Madera County Wildcat Fails to Show Commercial Oil Production

LOS ANGELES, Calif. — Observers felt early this week that Texas Co. might discover a new oil field in the Mendota section of Madera County and thus usher in the new year under auspicious circumstances, but the company's wildcat, 1 Gill in 16-13s-16e, failed to show commercial production. On a formation test at 4,526-75 ft. the company recovered 2,450 ft. of frothy oil and mud and 1,720 ft. of salt water. This proved to be a distinct disappointment as a soft, well-saturated oil sand with high porosity had been cored at 4,527-60 ft. This wildcat really looked hot during the course of drilling, but when the test proved unfavorable interest in the area cooled as fast as it built up. Officials of Texas Co., trying hard to maintain a normal equilibrium prior to the test, found it hard because the sand looked so promising. Drilling operations were resumed following conclusion of the formation test and late in the week the bit had reached a depth of 6,020 ft. without further encouragement of any kind. It is quite likely that Texas Co. has at least found a commercial accumulation of gas at Mendota as a formation test of a gas zone found at 4,419-4,517 ft. resulted in a gas flow at a daily rate of 10,000,000 cu. ft. On this test, gas hit the surface within 1 minute and continued flowing for the duration of the test. It is quite difficult to explain why 1 Gill at Mendota failed to show commercial production of crude oil and although all indications point to the probability that the zone was wet, the salt water could possibly be bottom water or water above the zone tested. The showing of this wildcat is too good to overlook and for this reason it is quite likely that Texas Co. will undertake additional exploration in the area in the event the present wildcat proves to be a dry hole.

Texas Co. extended the productive limits of the Antelope Plains field of Kern County several days ago when 54-6 Voight in 6-28s-20e was brought in flowing 218 bbl. of 17.2-gravity oil from the Williams zone of Miocene age and preparations are already under way to start additional drilling. Shell Oil Co. also finished a new well in this field during the week and will proceed with normal drilling. Shell found this field early in 1942, and while it remains to be seen whether Antelope Plains results in large sustained production the field will nevertheless prove of economic importance as it produces a heavy grade of crude oil at a comparatively shallow depth. This means low development costs and minimum use of critical materials. Indications point to the probability that the productive area will be relatively small but that ultimate recovery will be quite high. The field produces very little gas with production from the lower zone which means that the flowing life will be comparatively short and the pumping stage longer.

SAN JOAQUIN VALLEY COMPLETIONS

Antelope Plains, Kern County: Shell Oil Co. 65-6 Williams, 6-28s-20e, flowed 226 bbl., 17.1-gravity, 2 per cent cut, 18,000 cu. ft. gas, 32/64-in. bean, flow pressure 50 lb., T.D. 2,320 ft., perf. 2,191-2,315 ft., completed in Williams zone of Miocene age.

Texas Co. 54-6 Voight, 6-28s-20e, flowed 218 bbl., 17.2-gravity, 3 per cent cut, 20,000 cu. ft. gas, 24/64-in. bean, pressures 200/520 lb., T.D. 2,305 ft., perf. 2,151-2,305 ft., completed in Williams zone of Miocene age.

Mount Poso, Kern County: Shell Oil Co. 22 Vedder Rall, 9-27s-28e, pumped 114 bbl., 17.5-gravity, 21 per cent cut, T.D. -1,990 ft., perf. 1,968-90 ft., completed in Vedder zone of Miocene age.

Round Mountain wildcat district, Kern County: General Petroleum Corp. 1 Bishop, 14-28s-28e, dry in gray sand with streaks of oil sand, T.D. 2,990 ft., Vedder zone of Miocene age was barren.

Sacramento wildcat district, Sacramento County: Portable Drilling & Production Co. 1 Sacramento, 35-8n-4w, dry in gray sand, T.D. 117 ft., no showings of any importance reported.

Sites anticline wildcat district, Colusa County: Pacific National Petroleum Co. 1 Sites, 19-17n-4w, dry in gray sand, T.D. 1,408 ft., no showings reported except small amount of gas higher up in hole.

Stanislaus wildcat district, Stanislaus County: Don Pedro Oil Co. 1 Stanislaus, 9-6n-9w, dry in gray sand, T.D. 4,077 ft., no important showings reported.

COASTAL DISTRICT

The biggest disappointment in the coastal district was the failure of 1 Barnes of R. E. Havenstrite to flow commercially from a deep oil sand in the Del Valle field at 9,870 ft. A formation test at this depth resulted in recovery of all salt water which is strange because it had been suspected this sand would show large oil production. As a result of the failure of this zone to produce commercially, Havenstrite has plugged back the hole and will make a production test of oil sand found in what has been designated as the Bering sand at 8,000-75 ft. A string of 7-in. casing had been set over the lower zone at 9,700 ft. and the new test will be made by perforating this 7-in. casing. It is generally believed that Havenstite will be able to develop good production in the Bering zone because on a formation test made several weeks ago the well flowed at a daily rate of 2,000 bbl. of crude oil and 7,000,000 cu. ft. of gas. Union Oil Co.'s attempt to discover a new field in the Del Valle quadrangle met with failure this week when the company found the equivalent of the Barnes zone to be barren. This wildcat, located in 20-4n-17w, is being abandoned at 7,004 ft.

Tide Water Associated Oil Co. and General Petroleum Corp. are both going to continue wildcat exploration in the Gato Ridge-Los Olivos district of Santa Barbara County despite the fact that both recently drilled dry holes or at least wells that proved unproductive commercially. General Petroleum is getting ready to spud 1 Wickenden in 24-8n-32w, and Tide Water is preparing to build derrick for 1 Chamberlain in 33-8n-31w. The latter well is in the same section as 1 Davis which was drilled to 6,643 ft. and plugged back to 5,956 ft. At the latter depth the well was able to produce about 150 bbl. of heavy viscous oil provided enough distillate was pumped into the hole to permit pumping operations. The new well is being drilled on the assumption there is a possibility that light oil might be developed at some distance from the heavy viscous tarry mass. This tar body may be the result of the escape of the lighter hydrocarbon fractions in which event commercial production might be developed if the original accumulation could be found.

COASTAL DISTRICT COMPLETIONS

Conejo wildcat district, Ventura County: Los Angeles Basin Oil Co. 1 Conejo, 4-1n-20w, dry in thin tar zone, T.D. 1,746 ft., insufficient oil sand to produce commercially.

Del Valle wildcat district, Los Angeles County: Union Oil Co. 1 Newhall Land & Farming Co., 20-4n-17w, dry in gray sand and shale, T.D. 7,004 ft., only meager showings found from top to bottom, Barnes zone equivalent was wet.

Monterey wildcat district, Monterey County: Priest Valley Petroleum Co. 1 Priest Valley, 22-20s-12e, dry in gray sand and shale, T.D. 2,887 ft., no important showings reported.

LOS ANGELES BASIN

Texas Co. had made tentative plans to drill another well in the Buena Park field of Orange County early in the new year and the future status of the field may depend upon what this new project shows in the way of production. To date, Texas has drilled four wells at Buena Park of which two have been completed as oil producers and two abandoned as dry holes. This is one of the most interesting fields in the state from a development standpoint and although production was first developed about a year ago the future importance of the area from a production standpoint still remains to be definitely determined.

PERMIAN BASIN, PANHANDLE

Fullerton Extension Well Has Large Flow From Clear Fork

MIDLAND, Tex. — Throughout the entire West Texas Permian basin area there was a total of 85 rigs actually making hole as the year ended. This does not include the rigs still standing on wells making tests for potential, waiting on cement, or shut down.

In Andrews County, Humble Oil & Refining Co. 1 Schultz, SW SW Section 5, Block C-45, Public School Lands, tested 8 bbl. per hour on gas lift after cleaning out at 4,540 ft., total depth. The Fullerton pool extension of Texas Pacific Coal & Oil Co. 1 Jackson, Section 17, Block A-32, Public School Lands, promised to be the largest potential well in the field after acidizing the first two pay sections in the Clear Fork lime, kicking off at the rate of 54 bbl. per hour. Preparations were being made to treat the lower section. Total depth is 7,245 ft. in lime.

In Crane County, Gulf 1-A Dawson, Section 10, Block 6, H.&T.C. Ry. Co. Survey, was disappointing in the Simpson sand zone through perforations at 5,177-92 ft., and was preparing to test shallow shows encountered around 2,000 ft. Gulf 1 Estes, Section 2, Block B-28, Public School Land, was drilling below 6,030 ft.

In Hockley County, the outpost test contracted to 6,500 ft. of J. C. Hawkins 57-A Mallet, Labor 12, League 47, Edwards County School Land Survey, topped solid lime at 4,466 ft. and was drilling ahead about 4,800 ft. at last report.

In Pecos County, Continental 1 Claybrook, Section 2, Block 50, Township 9, T.&P. Ry. Co. Survey, will drill deeper after unsuccessful attempts at completion in the Delaware at a total depth of 5,253 ft. in black lime. Phillips Petroleum Co. 1 Ada Price, Section 11, Block 101, T.C. Ry. Co. Survey, was drilling below 8,450 ft. toward contract depth of 8,500 ft. Ungren-Frazier 1 White & Baker, 2,500-ft. test located 3½ miles northeast of the Walker pool in Section 67, Block 194, G.C.&S.F. Ry. Co. Survey, has started drilling after waiting for several weeks on rig.

Humble 1 Newman, western Scurry County wildcat which showed some porosity in Ellenburger at 8,175 ft., was fishing for 164 joints of 3½-in. drill pipe, total depth 8,336 ft.

Magnolia 20 State-Walton, deep Winkler County test 1 mile east of the Kermit pool which has been idle at a total depth of 8,445 ft. for several months, is to be deepened to approximately 11,000 ft. Shell 1 Blue, eastern Winkler test in Section 15, Block 46, Township 1s, was nearing its 8,500-ft. contract depth with no showings reported. Last depth reported was 8,405 ft., chert.

In Yoakum County, Barnsdall Oil 1 H. D. Heath, NE NE Section 315, Block D, J. H. Gibson Survey, topped the Yates frosted grains at 3,130 ft., favorably high, and was drilling below 4,100 ft. Elevation is 3,649 ft. Six wells in the Wasson pool are nearing completion and six are either drilling or are inactive.

Pecos County is the most active county in the Permian basin, with 45 tests on the active list, while Andrews County is a close second with 40 tests. Hockley County comes third with 32, Cochran next with 28, and then Crockett with 17.

WEST TEXAS COMPLETIONS

Wildcats

Scurry County: Col-Tex Ref. Co. 1 Maxie Wilson, SW NE Sec. 174, Blk. 97, R.& T.C. Ry. Co. Sur., elev. 2,379 ft., brown lime 1,630 ft., dry, T.D. 4,010 ft.

Fields

Abell, Pecos County: Skelly Oil 1 T. W. Hook, NW cor. Sec. 4, Blk. 3, H.&T.C. Ry. Co. Sur., elev. 2,389 ft., flowed 853 bbl. 43.4 gravity, pay 5,870 ft., perf. 5,870-5,900 ft., acid 2,000 gal., P.B. 5,901 ft., T.D. 5,905 ft.

Tal-Vez Oil 2 State-Silverman, E¼ S¼ W¼ Sec. 10, Blk. 3, H.&T.C. Ry. Co. Sur., flowed 150 bbl. natural, perf. 5,476-94 ft., pay 5,470 ft., P.B. 5,520 ft., T.D. 5,967 ft.

Embar-Ellenburger, Andrews County: Phillips Pet. 12 Univ.-Andrews, SE SE Sec. 24, Blk. 11, University Sur., elev. 3,277 ft., Ellenburger 8,128 ft., dry, T.D. 8,195 ft.

Emma, Andrews County: Sinclair Prairie 20 Emma Cowden, NE SW NE Sec. 12, Blk. 44, Twp. 2, T.&P. Ry. Co. Sur., flowed 813 bbl., 35.7 gravity, pay 4,191 ft., acid, T.D. 4,291 ft.

Iatan-East Howard, Howard County: Ray Oil 2 W. L. Foster, SE SW SW Sec. 42, Blk. 29, Twp. 1n, T.&P. Ry Co., Sur., elev. 2,246 ft., flowed 220 bbl., 32 gravity, pay 2,634 ft., shot, T.D. 2,725 ft.

Keystone-Colby, Winkler County: Texas Co. 12 Seth Campbell, SE SE Sec. 23, Blk. B-3, Public School Lands, elev. 2,894 ft., flowed 221 bbl., 39.3 gravity, pay 3,190 ft., T.D. 3,325 ft.

McCamey, Upton County: J. W. Ellis, trustee, 12-B J. W. Robbins, SE SW NW Sec. 4, Blk. 3, G.C.&S.F. Ry. Co. Sur., elev. 2,633 ft., pumped 71 bbl. 29 gravity, pay 2,080 ft., T.D. 2,293 ft.

Sand Hills, Crane County: Magnolia Pet. 5 K. W. Lea, SE SW Sec. 9, Blk. 32, Public School Lands, flowed 316 bbl., pay 4,334 ft., acid, T.D. 4,600 ft.

Slaughter, Cochran County: Devonian Oil 24-A Duggan, SE SE Lab. 3, Lge. 55, Oldham County School Land Sur., flowed 759 bbl., pay 4,975 ft., acid, T.D. 5,025 ft.

Slaughter, Hockley County: Magnolia 17-D Mallet, NE NE Lab. 9, Lge. 49, Edwards County School Land Sur., elev. 3,528 ft., flowed 887 bbl. 31.2 gravity, pay 4,940 ft., acid, T.D. 4,995 ft.

L. M. Glasco 3-C Mallet, NE NE Lab. 24, Lge. 48, Edwards County School Land Sur., flowed 662 bbl., 32 gravity, pay 4,926 ft., acid, T.D. 4,976 ft.

Texas Co. 134 Bob Slaughter, SE SE Lab. 81, Lge. 37, Zavalla County School Land Sur., elev. 3,516 ft., flowed 1,496 bbl., 30 gravity, pay 4,915 ft., acid, T.D. 4,995 ft.

J. C. Hawkins 17-A Mallet, NW NW Lab. 22, Lge. 47, Edwards County School Land Sur., flowed 927 bbl., 31 gravity, pay 4,953 ft., acid, T.D. 4,995 ft.

World, Crockett County: H. G. Eastham Jr. 4-A L. P. Powell, SW NW Sec. 52, Blk. BB, G.C.&S.F. Ry Co. Sur., elev. 2,712 ft., pumped 57 bbl. 30.9 gravity, pay 2,541 ft., acid, T.D. 2,602 ft.

Wasson, Yoakum County: Plymouth Oil 1-F Mrs. R. Bennett, SE SE SE Sec. 614, Blk. D, J. H. Gibson Sur., elev. 3,583 ft., flowed 541 bbl. 34 gravity, pay 5,200 ft., acid, T.D. 5,265 ft.

TEXAS PANHANDLE

The Texas Panhandle turned in more than the usual number of completions for the week, all of them successful. Carson and Hutchinson counties lead with two and three good completions, respectively.

PANHANDLE COMPLETIONS

Carson County: Skelly Oil 165 Schafer ranch, SW SW NE Sec. 197, Blk. 3, I.& G.N. Ry Co. Sur., elev. 3,165 ft., pumped 384 bbl., pay 3,005-3,107 ft., T.D. 3,113 ft.

Cities Service 1 Whitmore, NW NW Sec. 14, Blk. 7, I.&G.N. Ry Co. Sur., elev. 3,417 ft., pumped 212 bbl., pay 3,179-92 ft., T.D. 3,196 ft.

Gray County: Phillips Pet. 2 Reiger Davidson, NW NE NE Sec. 64, Blk. B-2, H.& G.N. Ry Co. Sur., elev. 3,086 ft., pumped 138 bbl., pay 2,935-3,007 ft., P.B. 3,007 ft., T.D. 3,032 ft.

Magnolia 56 fee, SW SW Sec. 15, Blk. 3, I.&G.N. Ry Co. Sur., pumped 23 bbl., pay 3,000-25 ft., T.D. 3,025 ft.

Hutchinson County: J. M. Huber Co. 3 Mayfield, NW SE SW Sec. 4, Blk. R-3, D.&P. Sur., elev. 3,353 ft., pumped 182 bbl., natural, pay 3,238-55 ft., T.D. 3,255 ft., lime.

J. M. Huber Co. 1 J. A. Stewart-Smith, C S½ Sec. 21, Blk. M-16, A.B.&M. Sur., elev. 3,338 ft., pumped 53 bbl., pay 3,060-3,261 ft., T.D. 3,249 ft.

J. M. Huber Co. 23 Weatherly, NE NW Sec. 25, Blk. Y, A.&B. Sur., elev. 3,106 ft., pumped 340 bbl. natural, pay 3,035 ft., T.D. 3,060 ft.

Moore County: Phillips Pet. 1 L.O.R. (W.H. Taylor), central Sec. 243, Blk. T, H.& T.C. Sur., elev. 3,490 ft., 91,000,000 cu. ft. gas, pay 2,755-2,040 ft., dolomite, P.B. 3,165 ft., T.D. 3,200 ft.

SOUTHEAST NEW MEXICO COMPLETIONS

Wildcats

Eddy County: Premier Pet. 1 Stablein, NW NE 15-16s-30e, elev. 3,812 ft., show oil 2,425-32 ft., 2,875-80 ft., 3,366-74 ft., dry, T.D. 3,802 ft. in lime.

Fields

Loco Hills, Eddy: Franklin Pet. 3-A Canfield, NW SW 7-18s-30e, elev. 3,537 ft., flowed 66 bbl. in 2 hr., pay 2,815 ft., shot, T.D. 2,835 ft.

Jackson, Eddy: Danciger O. & R. 10-B Turner, SW NE 20-17s-31e, elev. 3,667 ft., flowed 30 bbl., pay 3,403 ft., T.D. 3,450 ft.

Maljamar, Lea County: Phillips Pet. 2 Lea-Mex, SE SW 19-17s-33e, elev. 4,069 ft., acid, swabbed 27 bbl., 18½ hr., dry, T.D. 4,352 ft.

East Lusk, Lea County: Culbertson & Irwin 3 Lynch, SE SW 21-19s-32e, pay 2,770 ft., lime, T.D. 2,776 ft.

SOUTHWEST TEXAS

Karnes County Well Shows Oil on Drill-Stem Test

CORPUS CHRISTI, Tex. — Among possible pool openers in Southwest Texas a wildcat regarded as holding promise is Phillips Petroleum Co. and Adams Oil & Gas Co. 1 C. L. Reasoner, 5 miles southeast of Kenedy, in Karnes County. Following an electrical survey the crew made a 20-minute drill-stem test with ¼-in. chokes at top and bottom. The test, at 6,582-90 ft., produced 600 ft. of oil and 50 ft. of mud, with 150 lb. flowing pressure. Another test, at 6,501-6,606 ft., recovered 90 ft. of oil, 90 ft. of mud, and 650 ft. of salt water, with 12 lb. working pressure. It was believed the salt water came from the bottom 3 ft. of sand. The hole topped the Smithvillensis at 5,050 ft.

Gulf 2 Virginia Tatton, 3½ miles east of Tom O'Connor, Refugio County, which has been a center of interest since it was spudded last fall, was still testing at total depth of 8,680 ft. It flowed gas and a spray of distillate on ⅛-in. choke, with perforations at 8,460-90 ft., 8,400-30 ft., 8,300-30 ft., and 8,265-80 ft.

Stanolind Oil & Gas Co., which took over 1 L. Ulke, 4½ miles northwest of Tynan, in Bee County, from W. E. Rowe, to set casing and test, perforated at 4,212-13 ft. The well flowed at the rate of 288 bbl. of fluid daily, 60 per cent of it oil. Tubing pressure was 1,280 lb. and casing pressure 1,700 lb.

Auld, Carter & Coquat 1 A. Schorre, 5 miles south of Runge, in Karnes County, a Phillips farmout, was subjected to a 15-minute drill-stem test at 6,375-81 ft., with ¼-in. chokes at top and bottom. It recovered 63 ft. of oil and 430 ft. of salt water, with 53 lb. working pressure. It drilled ahead from 6,381 ft. and tested at 6,680-82 ft. with no results.

No shows had been reported in Sun Oil Co. 1 D. Laurel, 2 miles south of the North Sun field, in Starr County. This test, the deepest active one in the Rio Grande Valley, was around 8,000 ft. and drilling ahead.

LOWER GULF COAST COMPLETIONS

Wildcats

Nueces County: R. H. Hawn Co. 1 W. Bauer, M. L. D. Herrerra Sur., dry at 6,010 ft.

Refugio County: Bridwell Oil Co. 1 O. E. Glover et al, John Sinnott Sur., dry at 3,801 ft.

Fields

Agua Dulce, Nueces County: S. E. Wilson and Chicago Corp. 2 Carl Schubert, completed as dual input well at 7,079 ft., without taking gage.

North Pettus-Wilcox, Bee County: Union Producing Co. 59 G. A. Ray, W. J. Porter Sur., 50 bbl. through ¼-in. choke, with 28,500,000 cu. ft. gas, T.P. 2,310 lb., C.P. 2,460 ft., S.I., T.D. 7,047 ft.

Seeligson, Jim Wells County: Humble 9 King ranch-Cobera, W. L. Dickson Sur. 52, 132 bbl. through ⅛-in. choke, T.P. 1,170 ft., C.P. 320 lb., S.I., gas-oil ratio 671, T.D. 6,080 ft.

Shell 17 L. Seeligson, Willis Millican Sur. 335, 128 bbl. through 7/64-in. choke, T.P. 1,000 lb., C.P. 1,200 lb., gas-oil ratio 750, T.D. 6,100 ft.

Texas 1 H. C. de Tijerina, A.B.&M. Sur. 359, A-20, 21 bbl. through ¼-in. choke, T.P. 50 lb., gas-oil ratio 660, T.D. 6,300 ft., P.B. 5,652 ft.

South Caesar, Bee County: Atlantic Refining and Southwood Oil Co. 1 Grissom, McEarley Sur., 116 bbl. through 5/32-in. choke, T.P. 475 lb., C.P. 750 lb., gas-oil ratio 557, T.D. 6,625 ft.

Refugio County: P. R. Rutherford, 1-F P. H. Egan, Mary Byrne Sur., dry at 6,515 ft., completed as shut-in gas well, without taking gage (no field name).

SOUTH TEXAS COMPLETIONS

Wildcats

Jim Hogg County: Sun 2-A Ramirez, Agua Nueva de Abajo grant, dry at 4,110 ft.

McMullen County: Hickok & Reynolds 1 Shiner ranch, Gideon J. Goode Sur. 55, A-206, dry at 1,860 ft.

Fields

Colorado, Jim Hogg County: Humble 3-D T. T. East, Las Moritas grant, dry at 3,277 ft.

Humble 7 T. T. East, Las Moritas grant, 63 bbl. through ¼-in. choke, T.P. 20 lb., C.P. 550 lb., gas-oil ratio 225, T.D. 3,095 ft.

Kohler, Duval County: Ogden & Voyles 2 Richardson, Sur. 3, dry at 2,703 ft.

Kreis, Duval County: Circle Oil Co. 1 Reyes, dry at 3,492 ft.

Rincon, Starr County: Humble 5 San Antonio Loan & Trust Co., J. A. Robinson C.C.S.D. and R.G.N.G. Sur. 504, dry at 5,214 ft.

SOUTH CENTRAL TEXAS COMPLETIONS

Wildcats

Travis County: Marts & Beaven 1 P. Nelson, Peter C. Harrison 3 Sur., dry at 961 ft.

N. CENTRAL TEXAS

Five New Wildcats Located In Northern Sector

FORT WORTH, Tex.—Five new locations for wildcat tests were staked in four North Texas counties during the past week. In Archer County, east of the Scotland field, A. R. Dillard will drill 1 N. Schenk 330 ft. from the north line and 990 ft. from the east line of Section 20, Block 3, Clark & Plumb subdivision. The well is scheduled to go to 6,000 ft.

In Cooke County, Burk Royalty Co. will drill 1 J. W. Gladney to a depth of 2,500 ft., 330 ft. from the south and east lines of Section 24, Hunt County School Land, A-440, 3 miles southwest of Gainesville.

Montague County gets two of the new tests. Continental Oil Co. 1 Mrs. A. V. Fleming is located 330 ft. from the south and west lines of the Fleming 115-acre tract in the F. Secrest Survey A-665, 2½ miles southwest of Illinois Bend. Contract depth is 3,200 ft. G. S. Marvin, of Oklahoma City, will drill 1 J. E. Lemon, a 1,750-ft. rotary test 1,650 ft. from the west line and 330 ft. from the south line of the Lemon 297-acre tract in the M. Burnesides Survey A-14, 6 miles southwest of Spanish Fort.

In Young County, W. L. and C. W. Snoddy have staked location for a 5,000-ft. rotary test 2 miles southeast of Padgitt, 660 ft. from the north and west lines of Section 330, T.E.&L. Survey.

A possible new pay zone for the Wynn pool of Clay County was opened by Shell Oil Co. at its 3 Clark, H. Williams Survey. The well was being swabbed and recovered 2 bbl. of oil and 1 bbl. of water per hour. The oil was coming through 72 perforations in the casing from 3,950 ft. to 3,975 ft. Plugged-back depth is 3,980 ft. Other wells in the pool are producing from below 6,000 ft.

Definition of the east side of the Walnut Bend pool in northern Cooke County seems likely. Sinclair Prairie Oil Co. 1 Winger, Lot 70, Fannin County School Land Survey, found dry Ramsey sand from 5,019 to 5,049 ft., and the Best sand was also dry from 5,116 to 5,140 ft. At last reports the test was drilling ahead. The same operators were swabbing water from 6 Jones, I. Singletary Survey, in the Forestburg pool of southeastern Montague County. Casing had been perforated opposite the Marble Falls lime with 160 shots, and the formation had been treated with 2,000 gal. acid.

In Jack County, Youngblood & Foree 1 Cherryhomes, 6,500-ft. rotary test 8 miles east of Jacksboro, drilled dry sand from 5,551 ft. to 5,557 ft. and was drilling ahead.

The Park Springs area of northwestern Wise County may be in for some development in the near future. Leases purchased from Cranfill and Rodgers by Stanolind Oil & Gas Co. around the discovery well have but 2 years to run, which indicates a probable drilling campaign.

WEST CENTRAL TEXAS COMPLETIONS

Wildcats

Parker County: W. K. Jones 1 Darnell, NW NW Sec. 173, T.&P. Ry Co. Sur., elev. 1,180 ft., Ellenburger 6,078 ft., 900,000 cu. ft. gas, perf. 2,805-25, 3,214-40 ft., Strawn, T.D. 6,126 ft.

W. K. Jones 1 Stephens, NE NE Sec. 172, T.&P. Ry. Co. Sur., dry, T.D. 915 ft.

Shackelford County: W. M. Reed 1 Trice, Sec. 817, T.W.&L. Sur., dry, T.D. 770 ft.

O. E. Schkade 1 Schkade, Sec. 570, T.E. &L. Sur., dry, T.D. 920 ft.

NORTH TEXAS COMPLETIONS

Wildcats

Archer County: Avis B. Taylor 1 Hemmering, Sec. 1, B.B.B.&C. Ry Co. Sur. A-37, dry, T.D. 1,301 ft.

Wichita County: C. Y. Gorgan et al 4 W. L. Doyle, Lot 1, Geo. Wheelright Sur. A-320, dry, T.D. 1,214 ft.

Fields

Farmer, Young County: Phillips Pet. 20 Pan-Johnson, Lot 14, Edw. W. Sergeant Sur. A-253, 10 bbl., pay 566 ft., T.D. 584½ ft.

Ferguson, Young County: A. G. Talbot 1 P. Ferguson, L. W. Smoth Sur. A-1822, location abandoned.

Markley, Young County: Graham Roy 31 L. F. Gregg, A. Rohus Sur. A-420, 10 bbl., pay 714 ft., T.D. 729 ft.

Muenster, Cooke County: Camball Oil 2 W. H. and Louise Campbell A, O. F. Leverett Sur. A-607, dry, T.D. 1,482 ft.

Rock Crossing, Wilbarger County: Phillips Pet. 212 W. T. Waggoner Est., Sec. 46, Blk. 4, H.&T.C. Ry Co. Sur., dry, T.D. 1,945 ft.

EASTERN TEXAS

Travis Peak Test Located on Bone Hill Structure

DALLAS, Tex.—The Bone Hill structure of Shelby County will receive a 7,500-ft. Travis Peak test by Paul H. Pewitt, of Longview. Location is in the Milton Cook Survey, 680 ft. south of the north line and 694 ft. west of the east line of the survey, on land owned by the Pickering Lumber Co. Site of the well is about 4 miles northwest of Shelbyville.

The last week of the year did not bring forth many new locations in the fields, and many locations staked some time ago were still on the inactive list. Out of seven locations in the Kildare pool of Cass County, only one was actually drilling, and three were completed. Three rigs were making hole in the Chapel Hill field of Smith County, and three were waiting on cement or preparing to test after perforating casing. In the Coke field of Wood County only two wells were active, both testing preparatory to being put on production. In the same county, Hawkins had but two active wells as the year ended, while in the new pool northwest of Quitman rigs were being moved in to locations for north and south offsets to the discovery.

Kaufman County seems about to lose its only operation as C. F. Carter 1 S. D. Stanfield was shut down for orders after reaching a depth of 3,546 ft. Elevation was 419 ft., and Woodbine sand was found at 3,030 ft., dry.

In Smith County, Iowa Payne Oil Co. 1 A. Murray, wildcat 5 miles southeast of Chandler, was drilling below 3,000 ft., looking for the Woodbine. Elevation is 512 ft.

EAST TEXAS COMPLETIONS

Wildcats

Ellis County: J. B. Stoddard 1 W. E. Smith, 1,550 ft. from SW, 660 ft. from NW, J. B. Edwards Sur., elev. 480 ft., Woodbine 1,585-1,615 ft., Pettit 3,755-65 ft., Travis Peak 4,015-30 ft., Ouachita 4,875 ft., dry, T.D. 5,020 ft.

Hunt County: R. T. Myers 1 W. F. England, Marler Sur., elev. 533 ft., Woodbine 3,698 ft., Gtn. lime 4,550-60 ft., dry, T.D. 5,008 ft.

Limestone County: Peyton Bros. 1 J. L. Thompson, P. Varella Sur., elev. 548 ft., Woodbine sand 3,526 ft., dry, T.D. 3,700 ft.

Marion County: Hollandsworth Drlg. (Dean Bros.) 1 Hale, W. C. Ward Sur., elev. 302 ft., dry, T.D. 3,770 ft.

Fields

Carthage gas, Panola County: W. C. Feazel 1 E. L. Burnett, SE cor. Mallory Sur., elev. 210 ft., dual completion, perf. Rodessa pay 4,919-29 ft., perf. Pettit 5,672-5,700 ft., 73,000,000 cu. ft. gas, 17½ bbl. distillate, T.D. 6,086 ft., P.B. 5,705 ft., acid.

Chapel Hill, Smith County: Chapel Hill Gas System 1 R. S. Bradley, Thos. Payne Sur., flowed 75.4 bbl., ¼-in. choke, perf. 8,048-68 ft., 8,088-8,122 ft., acid, Pettit lime, T.D. 8,149 ft.

Kildare, Cass County: C. C. Gilger 2 Grogan Mfg. Co., J. Watson Sur., elev. 220 ft., flowed 260 bbl., 41.5 gravity, pay 5,980 ft., P.B. 6,025 ft., T.D. 6,040 ft.

Hollandsworth Drlg. 1 Benefield and Singleton, O.W.D.D. from 5,887 ft., James Wanhope Sur., flowed 195 bbl., perf. 6,000-16 ft., acid, T.D. 6,016 ft.

Roger Lacy 1 Cass County, J. M. Watson Sur., elev. 244 ft., 9,000,000 cu. ft. gas, 35 bbl. distillate, perf. 6,008-56 ft., T.D. 6,065 ft.

Hawkins, Wood County: Humble 6 G. W. Atkins, J. P. Moseley Sur., elev. 396 ft., flowed 404 bbl., pay 4,759-62 ft., sand, T.D. 4,845 ft., shale.

Humble 5 W. T. Minchew, SW cor. 99-acre tract, John Polley Sur., dry, T.D. 5,075 ft.

LOUISIANA GULF

St. Landry Parish Test Opens Gas-Distillate Pool

NEW ORLEANS, La. — Tests have established definitely that Gulf Refining Co. 1-E Haas-Hirsch, 3 miles southwest of Krotz Springs, St. Landry Parish, has opened a new gas and distillate pool. After a separator had been rigged up the well, drilled to total depth of 11,398 ft. and plugged back to 9,327 ft., was subjected to a 2-hour drill-stem test, with perforations at 9,316-26 ft. and ¼-in. chokes at top and bottom. It flowed at the rate of 17 bbl. of distillate per hour and at the rate of 3,990,000 cu. ft. of gas per day, with working pressure of 2,500 lb. and gas-oil ratio of 19,600. The crew pulled the testing tool and recovered 390 ft. of distillate. Hole pressure was 5,400 lb. and flowing bottom-hole pressure 2,800 to 3,900 lb. After the 2½-in. tubing had been run on packer several tests were made, all showing results, the last one 358 bbl. of distillate per day. The well is the deepest wildcat ever drilled in that district, and production is believed to come from below the Miocene.

American Republics Corp. 1-X Lutcher-Moore Lumber Co. wildcat test in Beauregard Parish, recovered 4 ft. of hard sand with good oil and gas odor at 9,753-57 ft. At 9,771-75 ft. it recovered 4 ft. of shaly sand with oil and gas odor. As the week closed it was coring at 9,905 ft. It topped the Wilcox at 9,680 ft.

No shows were revealed by an electric log taken at Humble 1 Louisiana Furs, Inc., 8 miles southwest of the Schooner Bayou field, in Vermilion Parish. After reaching total depth of 11,908 ft. a fishing job was started to recover bit blades lost in the hole.

Union Sulphur Co. 1 J. P. Gueno, in the Branch area of Acadia Parish, flowed 523 bbl. of 51-gravity distillate and 49,220,000 cu. ft. of gas on a 24-hour gage. Pressure on drill pipe was 240 lb., on 7-in. casing 320 lb., and on 10¾-in. casing 360 lb. The test, drilled to a total depth of 10,447 ft., was still flowing. The same company's 2

(Continued on Next Page)

TEXAS GULF COAST

Marginulina Forms New Pay Northeast of Mayo Field

HOUSTON, Tex.—A new sand is being opened by Lon Glasscock 1 J. M. Heard, in the Morris and Cummings Survey, Jackson County. This well, to the northeast of the Mayo field, underwent a 24-hour test, with perforations at 5,126-38 ft., flowing 30 bbl. of oil through 7/64-in. choke. Tubing pressure was 1,400 lb. and casing pressure 1,850 lb., shut in. The Mayo field produces from the 5,400-ft. Frio. The new pay is in the Marginulina. The total depth of the Glasscock well is 5,648 ft., plugged back to 5,166 ft. Testing was being continued.

Humble Oil & Refining Co.'s wildcat in the Halls Bayou area of Brazoria County, the 1-B Houston Farms Development Co., a deep test, was trying to recover a struck drill stem at 13,253 ft. It topped the Frio at 10,132 ft.

Continental Oil Co. was at 4,428 ft. in its Wharton County wildcat, 1 O F. Allenson, in the W.C.R.R. Survey, and was reported to be getting ready for a production test. The well is in the North Louise area, where Pan American Production Co. has put down several holes, all failures.

No information is being given out concerning Glenn H. McCarthy's wildcat 1 Hankamer-Morris & McLean, 2 miles northwest of the Stowell field, in Jefferson County, but reports are to the effect that it has found an oil show in the top of the Frio. Total depth is said to be about 8,600 ft.

Application for dual completion of 1 Grogan-Cochran Lumber Co., 3 miles southeast of Magnolia, in Montgomery County, has been made by Grey & Wolfe. This test, southwest of the Lake Creek field, in the Pinehurst area, is regarded as a probable pool opener.

TEXAS GULF COAST COMPLETIONS

Wildcats

Jackson County: W. S. Boyle et al 1 H. Banker, I.&G.N. Sur., dry at 6,014 ft.

Humble 1 San Antonio Joint Stock Land Bank, C. Lasso Sur., A-40, dry at 6,867 ft.

Victoria County: Rowan & Hope 1 M. E. McCampbell, V. Garcia Sur., A-45, dry at 6,501 ft.

Wharton County: Pan American 1 W. C. Babcock, S. P. Middleton Sur., dry at 5,788 ft.

Fields

Amelia, Jefferson County: Humble 1-B S. L. Guinn, G. Williams Sur., A-59, O.W. W.O., old T.D. 6,778 ft., completed as salt-water-disposal well.

Boling, Fort Bend County: Mackhonk Petroleum Co. 2 Texas Gulf Sulphur Co., J. Scott Sur., A-84, location abandoned.

Boling, Wharton County: Danciger Oil & Refining Co. B-1 E. Hawes estate, S. F. Austin Sur., A-2, 484 bbl. through ¼-in. choke, T.P. 475 lb., C.P. 675 lb., gas-oil ratio 583, T.D. 3,093 ft.

Buckeye, Matagorda County: United North and South Development Co. 7 C. G. Stoddard, G. M. B. Cotton Sur., A-17, 146 bbl. through 9/64-in. choke, T.P. 560 lb., C.P. 730 lb., T.D. 8,598 ft.

Ganado, Jackson County: Texas 2 A. T. Ross, G. F. and M. T. Simons Sur., A-290, 33 bbl. through ⅛-in. choke on 4-hr. potential test, T.P. 1,000 lb., gas-oil ratio 520, T.D. 6,480 ft.

Harmon, Jackson County: Gulfboard Oil Corp. C-2 J. E. Harmon, Morris and Cummings Sur. 23, A-239, location abandoned.

Katy, Waller County: Stanolind 1 J. W. Thorpe, J. M. Bennett Sur., O.W.W.O., old T.D. 7,647 ft., new T.D. 7,385 ft., 120,000,000 cu. ft. gas open flow, 3,720,000 cu. ft. gas through ¼-in. chokes.

Livingston, Polk County: Jordan Drilling Co. 1 I. B. Munson, A. Viesca Sur. A-77, O.W.W.O., old T.D. 7,396 ft., drilled out to P. B. T.D. 7,050 ft., 90 bbl. on gas lift, with input pressure 350 lb.

Mayo, Jackson County: Pan American 1 F. Bigot, Morris and Cummings Sur., A-231, 16 bbl. oil and 149,000 cu. ft. gas through 9/32-in. choke top and 9/64-in. choke bottom, T.P. 850 lb., gas-oil ratio 93,125, T.D. 7,612 ft.

Tide Water 1 F. A. Ratliff, W. H. Robertson Sur., A-404, O.W.W.O., old T.D. 5,600 ft., set plug 5,340-5,418 ft., drilled out to 5,388 ft., flowed dry gas through ⅛-in. choke, T.P. 2,050 lb., shut in.

Stanolind 1 Westhoff & McCrory, M. L. York Sur., A-312, 16 bbl. through 7/32-in. choke, T.P. 120 lb., C.P. 450 lb., gas-oil ratio 6,410, T.D. 5,571 ft.

Old Ocean, Brazoria County: Harrison & Abercrombie 14 Bernard Development Co., Imla Keep Sur., 662 bbl. through ¼-in. choke, T.P. 2,100 lb., gas-oil ratio 2,600, T.D. 10,886 ft.

Oyster Bayou, Chambers County: Sun 3 A. Middleton, T.&N.O.R.R. Sur., 172 bbl. through ⅛-in. choke, T.P. 1,380 lb., gas-oil ratio 832, T.D. 8,580 ft., P.B. 8,501 ft.

Satsuma, Harris County: Amerada and Stanolind 2-C L. Dopslauf, R. W. Armstrong Sur., O.W.D.D., old T.D. 6,832 ft., new T.D. 7,285 ft., 163 bbl. through ⅛-in. choke, with 133,650 cu. ft. gas, T.P. 1,150 lb., gas-oil ratio 819.

Amerada and Stanolind 1-A 1 Dopslauf, Francis Fry Sur., A-267, O.W.D.D., old T.D. 6,845 ft., new T.D. 8,050 ft., 160 bbl. through ⅛-in. choke, T.P. 1,150 lb., gas-oil ratio 822.

Sour Lake, Hardin County: E. C. Henkamer et al 1 Marrs McLean, S. Jackson Sur., dry at 3,065 ft.

Spindletop, Jefferson County: Stanolind 103 Gladys City, John A. Veatch Sur., A-55, dry at 5,891 ft.

Stewart, Jackson County: Harrison & Abercrombie 1 Taylor-Bagby, George Sutherland Sur., A-75, dry at 5,030 ft.

Stowell, Jefferson County: Glenn H. McCarthy 1 William Stoeger, B. A. Vacocu Sur., A-53, 18 bbl. through ⅛-in. by 6-in. positive chokes, with 1,500,000 cu. ft. gas, T.P. 2,950 ft., S.I., C.P. 3,200 lb., T.D. 8,530 ft.

Braxton County, Salt Lick district: Pittsburgh & West Virginia Gas Co. 7902 G. L. Cabot, Inc., 378,000 cu. ft. gas, through Gordon sand, T.D. 2,061 ft.

Kanawha County, Poca district: Shale Gas Co. 1 Sarah S. Dawley, 700,000 cu. ft. gas before shot, Big lime 1,505-1,750 ft., Injun 1,765 ft., gas 1,765-67 ft., T.D. 1,767 ft.

ORISKANY GAS FIELDS

Putnam County, Union district: Godfrey L. Cabot, Inc. 1074 Putnam Co., Corniferous lime 4,939 ft., Oriskany 5,027 ft., gaging 94,000 cu. ft. gas at 5,051 ft.

Godfrey L. Cabot, Inc. 1075 Eva Carney, Corniferous lime 5,111 ft., Oriskany gaging 200,000 cu. ft.

Louisiana Gulf Coast

(Continued from Preceding Page)

Gueno, drilled as a relief well to No. 1, was at 8,789 ft. in shale and lime.

A blowout interrupted drilling operations at Jack W. Frazier 1 Sweet Lake Oil & Land Co., a Stanolind Oil & Gas Co. farmout in the Chalkley district of Cameron Parish. The well, projected to go to 9,500 ft., started blowing out at total depth of 8,760 ft. The crew pulled the drill stem up 30 ft. and closed the blowout preventer. As the week closed, the well was blowing an unestimated quantity of gas and drilling mud through the drill stem. Efforts were being made to kill the well.

LOUISIANA GULF COAST COMPLETIONS

Wildcats

St. Charles Parish: Louis J. Roussell 1 Ellington Sugars, 119-13s-20e, ¼ mi. SE of Boutte, dry at 4,521 ft.

Fields

Bay de Chene, Jefferson Parish: Texas A-3 La Fourche Basin Levee District, 33-19s-24e, dry 9,365 ft.

Bayou Blue, Iberville Parish: Union Sulphur Co. 6 Schwing Lumber & Shingle Co., 67-9s-11e, perf. 6,512-32 ft., 175 bbl. through 10/64-in. choke, T.P. 1,200 lb., C.P. 1,300 lb., T.D. 6,939 ft., P.B. 6,439 ft.

Charenton, St. Mary Parish: Pan American 17 Laws Realty Co., 31-13s-10e, O.W.W.O., old T.D. 7,208 ft., squeezed perforations and perf. 7,085-7,126 ft., 65 bbl. through ⅜-in. choke at bottom and 5/32-in. choke at top, 250 lb., gas-oil ratio 3,411.

Jennings, Acadia Parish: D. D. Feldman et al (formerly Jolly Petroleum Co.) 2 L. McFarlin, 41-9s-2w, O.W.W.O., old T.D. 7,226 ft., workover failed to start production.

R. W. O'Mera 1 Moresi, O.W.W.O., old T.D. 7,054 ft., squeezed and drilled out to 6,966 ft., 235 bbl. through 10/64-in. choke, T.P. 800 lb., C.P. 900 lb., gas-oil ratio 1,034.

Paradis, St. Charles Parish: Texas 31 L. L. and E. Paradis, 39-14s20e, perf. 20,170-10,202 ft., 216 bbl. through 8/64-in. choke, T.P. 1,630 lb., gas-oil ratio 655, T.D. 10,534 ft.

Texas 1 C. V. Singleton, 38-14s-20e, perf. 10,232-50 ft., 276 bbl. through 9/64-in. choke, T.P. 1,600 lb., gas-oil ratio 721, T.D. 10,400 ft.

Schooner Bayou, Vermilion Parish: Union Oil of California 6-A Louisiana Furs, Inc., 15-15s-1e, perf. 6,808-13 ft., 211 bbl. through 10/64-in. choke, T.P. 800 lb., C.P. 1,500 lb., gas-oil ratio 450 lb., T.D. 8,561 ft.

West Mermentau, Jefferson Davis Parish: H. M. Naylor et al 3 Acadia Development Co. 12-10s-2w, perf. 10,192-10,227 ft., 281 bbl. distillate through ¼-in. choke, T.P. 2,400 lb., gas-oil ratio 7,293 ft., T.D. 10,228 ft.

APPALACHIAN FIELDS

Majority of Drilling Wells Halted by Flood Conditions

PITTSBURGH, Pa.—The final week of the year ended with few completions reported due to the usual holiday shutdowns of all but wells drilling in and storm and flood conditions which raged in all of the water sheds of the Appalachian areas. At Pittsburgh a stage of 36.6 ft. was reported which evidences what may be expected in the lower areas and from which it will take days to recover.

Runs from producers' tanks in Southwest Pennsylvania and West Virginia continue to decline, partially due to viscosity changes in cold weather but mostly due to the lack of new production. The lack of new production is attributed partly to the initial operations of M-68, which halted practically all drilling and ceiling on the price structure. Small independent operators prefer to locate for gas rather than attempt edgepool extensions for oil. In Southwest Pennsylvania this is notable, as so far this year eight wells completed produced oil yet but five of them are producing, two were deepened for gas and one was soon exhausted. Normally in the area where two wells produced from the Dunkard sand in Greene County, offsets would have been drilled as tests of that formation as there was a fair showing and had the pool developed close spacing would have been necessary as in the Dunkard sand pool around Willow Tree. Regulations and price stopped it dead.

Despite the number of wells listed as still active in the area, about 190 in West Virginia and 63 in Southwest Pennsylvania, of which four are deep tests, only seven wells were completed during the week of which one was dry, and six were gas wells.

On Chestnut Ridge in South Union Township, Fayette County, New Penn Development Co., William E. Snee et al are drilling at 5,573 ft. in 2 Indian Creek Coal Co. and Peoples Natural Gas Co. at 6,226 ft. in 1 Walters. On Laurel Ridge in Ligonier Township, Westmoreland County, New Penn Development Co. et al have reached 7,242 ft. in the deep test on the John and Eleanor Beck farm.

In Maryland, William E. Snee et al reached 5,045 ft. in the old 1 Speicher on the Accident dome in Garrett County and shut down for the holidays and have just resumed drilling.

SOUTHWEST PENNSYLVANIA COMPLETIONS

Greene County, Monongahela Township: Brummage et al 1 Elmer Beckham, 70,000 cu. ft. gas, Elizabeth sand 2,962-76 ft., gas 2,965 ft., T.D. 3,070 ft.

Washington County, Hanover Township: George Freshwater et al 1 R. D. Koethe, drilled deeper, dry, Thirty-foot sand 1,925 ft., T.D. 1,998 ft.

WEST VIRGINIA

During the week seven wells reached the Corniferous lime in the Oriskany fields in West Virginia but all shut down until after the holidays. Few distinct wildcats are now drilling, the notable exception being in Tucker County and in the recent activity in Raleigh and Wyoming counties. In Jackson County, extensions to the gas pool are still being sought.

WEST VIRGINIA COMPLETIONS

Boone County, Scott district: Owens, Libby-Owens 642 (37) Allen & Pryor, 133,000 cu. ft. gas, from Berea, Big lime 1,389 ft., Injun 1,603 ft., Berea 2,076 ft., T.D. 2,131 ft.

ROCKY MOUNTAIN

Colorado Wildcat Recovers Water on Initial Test

DENVER, Colo.—The Rocky Mountain area broke an old tradition again by slipping into the new year without chalking up a discovery in the last week of the old year. Two of the most promising wildcats reached their objectives at the appointed time but failed to score.

The Ramsey Petroleum Corp. 1 Graham, SW SW 14-7n-59w, Weld County, Colorado, which cored saturation in the Muddy sand at 6,652-64 ft., but proved to be uncommercial, topped the Lakota at 6,735 ft. and showed approximately 1 ft. of saturated sand followed by very hard sand, and passed out of that horizon at 6,762 ft. Then it picked up a thin sand in shale at 6,815-25 ft. from which water rose 2,000 ft. in the hole. In order to be certain whether this is the Lakota sand, drilling is continuing to see if there is a lower sand and is making hole at 6,885 ft. in shale.

The other disappointment was Broderick & Gordon 1 Fidelity Trust, CEL SW SW 27-3n-1w, Pilot Butte field, Fremont County, Wyoming. It is located 1¾ miles due south of the Superior-British-American discovery well in the Tensleep and tested out the possibility of a high on that side. It had an estimated flow of 35,000,000 cu. ft. of gas in the Muddy sand topped at 3,280 ft., but continued on down to test the Tensleep. This horizon was topped at 6,259 ft. and 1 ft. in the hole filled with water. It will plug back to the Muddy and complete as a gas well. Drilling at Pilot Butte has narrowed down the productive area to much less than at first was indicated by the Tensleep discovery and the possibility that the producers so far completed are on the flank of high further to the north is being tested out in British American 1-E Tribal, 3 miles to the northwest of the discovery which has spudded.

Sinclair-Wyoming 28 Unit, listed as a completion in the Wertz field, on the Sweetwater side, in Wyoming, for 600 bbl. initial, is an outpost on the

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Secondary Recovery Can Salvage Stripper Wells

(Continued from Page 141)

tract, and three in the Parker, and the line of input wells extending in a row across the 40. In the center of each square, the corners of which are formed by input wells, a producing well has been drilled. This makes a pattern 330 ft. between water wells and the same distance between producing oil wells in the Siggins and 660 in the Parker. The Siggins 40 contains 25 input wells and 16 oil-producing wells, and the Parker 40 contains 9 water wells and 4 oil wells.

The input wells will be subjected to sufficient water pressure to cause the oil-producing wells to flow.

There will be no brine-disposal system since all brine will be recycled, being readmitted in turn to the oldest part of the flooded territory.

Water for the projects is piped through a 6-in. line from a drilled well in the valley of Hurricane Creek 5½ miles away.

Summary

Gas repressuring has already increased production by about 1,000 bbl. per well in Illinois territory in which it has been tried, and accidental floods have been shown to increase production of wells by an average of 10,000 bbl. each in the cases studied.

If the 10,000 stripper wells in the old field not already affected were put under gas repressuring or flooding and if recoveries averaging 5,000 bbl. per well were obtained, the total would reach the respectable figure of 50,000,000 bbl. To this could be added the far greater amount which is to be expected from secondary recovery of the stripper-well reserve of the new fields.

Sixteen thousand of Illinois' 24,000 wells are strippers. They insure a large recovery. Premature abandonment would present a great waste at any time and particularly in wartime.

Needless to say, gas and its energy should no longer be wasted at a time when oil is ammunition. The wide adoption of repressuring in Illinois would be speeded up by a regulation prohibiting the waste of gas by requiring it to be used or to be returned to the same or another oil-producing zone.

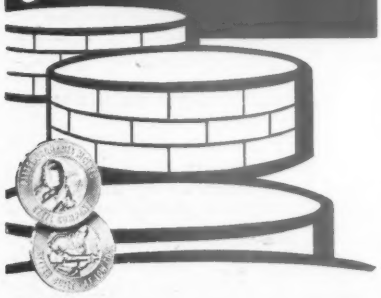
In any case applying secondary recovery of Illinois stripper oil reserve is a sure means of providing more oil to meet the war emergency.

RESULTS ON OIL PRODUCTION OF ACCIDENTAL FLOODS IN ILLINOIS

Name of lease, location, and group—	Time of flood	No. of years production used	Bbl. of flood increase	No. of wells flooded	Av. flood production per well	Av. flood production per yr. per well	No. of acres flooded	Flood production per ac.	Av. flood production per yr. per ac.
Kraft, 1-7n-13w, Kibbe*	1923-31	9	38,500	4	9,625	1,069	7	5,500	611
McKnight, 12-7n-13w, Kibbe*	1911-	20	22,843	1	22,843	1,142	2.5	9,137	456
Hawkins, 31-7n-13w, Oblong*	1917-18	1	5,250	1	5,250	5,250	2.5	2,100	2,100
Wurtzberger, 28-7n-13w, Oblong*	1926-	6	4,516	1	4,516	752	2.5	1,806	301
Frazier, 30-7n-13w, Oblong*	1929-	3	5,114	2	2,557	852	5	1,023	341
Rhodes, 30-7n-13w, Oblong*	1922-	10	18,272	1	18,272	1,827	2.5	7,308	730
Hook and Wylde, 30-7n-13w, Oblong*	1928-	4	2,854	1	2,854	713	2.5	1,141	285
E. V. David, 31-7n-13w, Oblong*	1925-	4	5,950	2	2,975	743	5	1,190	297
D. P. Kirtland, 5-7n-13w, Oblong*	1925-	7	5,898	1	5,898	842	2.5	2,359	337
Harbinson, 6-7n-13w, Oblong*	1927-	5	7,380	1	7,380	1,476	2.5	2,952	590
D. A. Mefford, 28-7n-12w, Robinson*	1918-	16	18,218	1	18,218	1,138	2.5	7,287	455
C. C. Baker, 21-7n-12w, Hebron*	1920-	16	16,000	2	8,000	500	10	1,600	100
Lawrence and Funk, 21-7n-12w, Hebron*	1915-29	14	12,656	1	12,656	904	2.5	5,062	361
Oliver Lowrentz, 7-5n-13w, Hardinsville*	1924-30	8	25,307	2	12,653	1,606	12	2,109	264
Mary Hoke, 7-5n-13w, Hardinsville*	1924-30	8	13,700	3	4,566	570	7.5	1,826	278
P. Fowler, 26-6n-13w, Hardinsville*	1921-26	5	3,160	1	3,160	632	2.5	1,264	252
Ma Sparks Acct. 2, 36 and 1-6n-13w, Hardinsville*	1932-	4	10,779	1	10,779	2,695	4	2,695	674
Asbury Pope, 36 and 1-6n-13w, Hardinsville*	1912-24	12	35,957	1	35,957	2,996	5	7,191	599
W. Montgomery No. 2, 20-5n-12w, Montgomery*	1925-	7	6,451	1	6,451	921	2.5	2,580	370
H. C. Johnson, 25-5n-13w, Tracey†	1933-	4	1,250	1	1,250	312	2.5	500	125
Oscar Smith, 20-4n-12w, Kirkwood‡	1925-30	7	36,689	1	36,689	5,241	5	7,338	148
T. E. Combs, 20-4n-12w, Kirkwood‡	1926-	11	60,606	2	30,303	2,754	5	12,121	1,102
Alice Biehl, 14-1n-12w, Allendale§	1935-36	2	7,630	1	7,630	3,810	2.5	3,052	1,526
Jake Smith, 22-1n-12w, Allendale§	1935-36	2	17,577	3	5,859	2,930	7.5	2,343	1,171
Stillwell. 7-1n-11 and 12w, Allendale§	1935-36	1	3,900	1	3,900	3,900	2.5	1,560	1,560
Joe Keyser, 13-1n-12w, Allendale§	1935-36	2.25	12,594	2	6,297	2,800	5.0	2,519	1,119
Della Wright, 8-1n-12w, Allendale§	1935-36	1.75	13,257	1	13,257	7,600	2.5	5,303	3,030
			412,308	40			115.5		

*Crawford County, Robinson sand. †Lawrence County, Tracey sand. ‡Lawrence County, Kirkwood sand. §Wabash County, Beihl sand.

FOR PEACETIME DEPENDABILITY
IN RAPID WARTIME TANK CONSTRUCTION



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ILLINOIS

Devonian Strike Reported In Christian County

MATTOON, Ill.—In the northern part of the Illinois basin, another Devonian strike was reported last week when the Marlow et al 1 Ralph, S½ NE NE 27-15n-2w, near Mount Auburn in Christian County, was brought in as a flowing well from the Devonian lime. Operators estimated the wildcat to be good for a potential of 700 bbl. daily. It topped the Devonian at 1,900 ft. and began flowing oil after penetrating the formation only 4 ft.

The 1 Ralph is located more than 50 miles northwest of the Louden pool of Fayette County, the nearest pool producing from the Devonian. The Louden pool is also the nearest pool which has production of any consequence, although a few smaller pools are located closer to the new strike. The Marlow well is the first well to discover Devonian production outside the general area between the Louden and Irvington pools since the Illinois basin play started in 1937, and is the third Devonian discovery within recent months.

Another wildcat strike which promises to open the first Illinois pool for 1943 is the Burr Lambert 1 Nellie Van Schiock, 555 ft. from the north and 472 ft. from the west lines of SE NW 18-1n-10e, in northwestern Edwards County. No. 1 Van Schiock recovered 950 ft. of oil and 100 ft. of oil-cut mud on a 1-hour drill-stem test of the Aux Vases sand at 3,135-53 ft. Casing has been set at 3,138 ft. for an immediate production test.

Two tests in the South Sailor Springs area of Clay County attracted attention of Illinois oil men during the past week. W. C. McBride 2 W. F. Moench, NW NW NE 10-3n-7e, recovered free oil on a drill-stem test of the Pennsylvanian sand at a depth of only 510-24 ft. However, operators are drilling ahead to the Cypress sand.

Meanwhile, the W. C. McBride 1 Edgar Hancock, NW NE NE 10-3n-7e, just ¼ mile east of the 2 W. F. Moench, recovered 1,175 ft. of oil and 434 ft. of oil-cut mud on a 1-hour drill-stem test of the Glen Dean lime at 2,394-2,429 ft. and set casing for a test of the formation. Very slight showings of oil have been encountered in the Glen Dean lime a few times elsewhere in the basin, but McBride's test is the only one to recover oil from this formation and is by far the most significant one to date.

ILLINOIS COMPLETIONS

Wildcats

Clay County: Delk Inv. Corp. 1 A. L. Newman, E½ SW NW SE 8-2n-5e, dry at 3,071 ft., Glen Dean 2,364 ft., Cypress 2,558 ft., Benoist 2,728 ft., Aux Vases 2,830 ft., Ste. Genevieve 2,862 ft., St. Louis 3,068 ft.

Jasper County: Helmerich & Payne 1 D. Millimar, SW NW SW 1-5n-10e, dry at 2,966 ft., Glen Dean 2,310 ft., Benoist 2,694 ft., Aux Vases sand 2,756 ft., Ste. Genevieve 2,810 ft., St. Louis 2,930 ft.

St. Clair County: V. J. Nolan 1 J. D. Schoen, SE SE SW 26-2n-6w, dry at 2,689 ft., St. Louis 972 ft., Devonian 1,990 ft., Trenton 2,648 ft.

Shelby County: Roy Lee, trustee 1 Stevens heirs, SE SE SW 2-10n-4e, dry at 2,055 ft., Glen Dean 1,551 ft., Cypress sand 1,696 ft., Benoist sand 1,826 ft., Aux Vases sand 1,859 ft., Ste. Genevieve 1,914 ft., St. Louis 2,040 ft.

Wayne County: Deep Rock 1 St. Louis Bank, NW SE 7-1s-8e, pumped 270 bbl. oil and 14 bbl. water, acidized, McClosky 3,281-86 ft., T.D. 3,319 ft., P.B. 3,293 ft.

White County: Delk Inv. Corp. 1 Joe Doerr, SW NE SE 34-4s-9e, dry at 3,405 ft., Glen Dean 2,695 ft., Benoist sand 3,070 ft., Ste. Genevieve 3,270 ft.

Minerva Oil 1 Evan McCalister, SE NW SW 33-6s-10e, dry at 3,100 ft., Benoist sand 2,758 ft., Aux Vases 2,890 ft., Ste. Genevieve 2,932 ft., McClosky 2,985 ft.

Fields

East Centerville, White County: Amerlagene 4 Rudolph unit, NE SE NE 18-4s-10e, pumped 24 bbl., shot 2,516-36 ft., Tar Springs sand 2,512-46 ft., T.D. 2,546 ft.

East Dundas, Jasper County: Gulf Refining 2 B. Stiff, SE SW NE 23-5n-10e, flowed 500 bbl., McClosky 2,939-45 ft., T.D. 2,951 ft.

Friendsville, Wabash County: Sinclair-Wyoming 1 Majors, NW NW SW 2-1s-13w, pumped 55 bbl. oil and 10 bbl. water, shot 2,339-42 ft., Weiler 2,332-42 ft., T.D. 2,459 ft.

Grayville, White County: S. C. Yingling 2 Reeves heirs, NE SW SW 20-3s-14w, pumped 160 bbl. oil, 2 per cent water, Biehl pay 1,883-88 ft., T.D. 2,755 ft.

S. C. Yingling 4 Bretz, NW NW SE 20-3s-14w, pumped 175 bbl., shot 2,797-2,806 ft., Weiler 2,792-2,808 ft., T.D. 2,808 ft.

Irvington, Washington County: Gulf Refining 4 Brink, NW NW SW 14-1s-1w, pumped 40 bbl., shot 1,393 ft., Cypress sand 1,386 ft., T.D. 1,546 ft.

New Harmony, White County: Sinclair 10 M. Donald, NE NE SW 21-4s-14w, swabbed 135 bbl., shot 2,835-55 ft., Aux Vases sand 2,826 ft., T.D. 2,855 ft.

Phillipstown, White County: Jarvis & Marcell 3 Spencer Comm., SW SW SW 31-4s-11e, pumped 100 bbl., shot 1,940-44 ft., Degonia 1,938-53 ft., T.D. 2,705 ft.

Roland, White County: Skelly 1 R. G. Mobley, SW SE SE 14-7s-8e, dry at 3,067 ft., Tar Springs sand 2,270 ft., Cypress sand 2,604 ft., Aux Vases sand 2,891 ft., Ste. Genevieve 2,918 ft.

Rural Hill, Hamilton County: Ohio 3 O. C. Smith, SE SE NW 24-6s-5e, dry at 3,141 ft., Glen Dean 2,490 ft., Cypress 2,802 ft., Aux Vases 3,098 ft., Ste. Genevieve 3,128 ft.

South Sailor Springs, Clay County: W. C. McBride 1 C. E. Brehm, NW SE NW 10-3n-7e, pumped 30 bbl., natural, Cypress 2,617-26 ft., T.D. 2,626 ft.

Walpole, Hamilton County: Texas 7 O. Irwin, NE NE NE SE 27-6s-6e, gas-input well, shot 3,073-3,100 ft., Aux Vases sand 3,060 ft., T.D. 3,100 ft.

Rocky Mountain Area

(Continued from Preceeding Page)

northwest side, being one location west of the nearest producer.

WYOMING COMPLETIONS

Cole Creek, Natrona County: General Petroleum Corp. 33-21-Government, NW SE NW 21-35n-77w, T.D. 4,544 ft., 5½-in. on top of the Shannon sand at 4,502 ft., pumped 90 bbl. first 24 hr.

Wertz, Carbon-Sweetwater counties: Sinclair-Wyoming Oil Co. 28 Unit, NE SW SE 1-26n-90w, T.D. 6,495 ft., 7-in. cemented on top Tensleep at 6,130 ft., 600 bbl. per day from Tensleep.

KANSAS, NEBRASKA

Kansas Operations Halted by Snow Storm

OIL operations in Kansas at the start of the new year were delayed by snow, which in some parts drifted so that heavy trucks of supplies were unable to break through. A shortage of fuel oil at a number of tests will prolong the shutdown.

In southeastern Saline County, 1½ miles north of Roxbury, Deep Rock Oil Corp. 1 Hunter, NE NW SW 20-16-1w, was showing for a new oil pool, when it found pay in the Mississippian chat topped at 2,674 ft. It was reported to have bailed oil after deepening to 2,683 ft., where an increase of oil was found.

In Barton County, south of Great Bend and north of the Hiss pool, Mid-Continent et al were preparing to acidize their discovery, 1 Harrison in NW NW NE 18-20-13w, after receiving a temporary potential of 51 bbl. of 36.5-gravity oil a day.

Although Kansas' production dropped this week, the January OPC allowable of 310,000 bbl. is an all time high. Kansas crude-oil purchasers set their January demand at 337,752 bbl. daily, also a record high.

KANSAS COMPLETIONS

Fields

Beaumont, Greenwood County: K. T. Wiedemann 4 Temple, SW SE NW 25-27-8e, pumped 25 bbl., Mississippi lime 2,437-52 ft.

Bemis, Ellis County: Champlin Ref. 2-L Hadley, E½ NE SE 30-11-17w, pumped 100 bbl., Arbuckle 3,538-51 ft.

Champlin Ref. 1-J Hadley, SW SE 30-11-17w, pumped 25 bbl., Arbuckle 3,471-3,503 ft.

Chase, Rice County: Harwood Oil 1 C. Seany, NW SW 30-19-9w, pumped 173 bbl., Arbuckle 3,262-64 ft.

Aylward Prod. 1 Proffitt, NW NW 20-19-9w, pumped 496 bbl., Lansing and Arbuckle 2,985-89 ft., 3,248-65 ft., T.D.

Crowther, McPherson County: Westgate-Greenland 1 Pisel, S½ SW NW 26-17-1w, 3,000 bbl., Mississippian chat 2,758-76 ft.

Fairport, North, Russell County: Liggett 2-A Hines, SW NW 16-11-15w, pumped 110 bbl., Lansing 3,244-47 ft., T.D. 3,393 ft.

Hugoton, Haskell County: United Producing 1 Hall, approx. C 28-29-34w, 5,500,000 cu. ft. gas, pay 2,520-2,746 ft.

Kraft-Prusa, Barton County: Black-Marshall 3 Grossardt, SW NW 4-17-11w, pumped 512 bbl., Arbuckle 3,308-27 ft.

Amerada and Vernon O. & G. 1 Hoffman, NW NE 36-16-12w, pumped 336 bbl., Arbuckle 3,370-90 ft.

Aylward Prod. 2 South Wendtland, SW NE 4-17-11w, pumped 50 bbl., Arbuckle 3,319-33 ft.

McLouth, Jefferson County: Miller & Smythe 1-A Federal Land Bank, NE NW NE 29-9-20e, 10,600,000 cu. ft. gas, sand 1,443-59 ft.

Lindsborg, McPherson County: Carter Oil 1 A. W. Carlson, SE NW 7-17-3w, pumped 389 bbl., Viola 3,413-17 ft.

Carter Oil 1 Rundbeck, SE SW 5-17-3w, pumped 108 bbl., Viola 3,342-47 ft., T.D. 3,480 ft.

Peace Creek, Reno County: Auto-Ordnance 4 Hollenback, SW SW SW 28-23-10w, swabbed 62 bbl. in 1 hr., potential 2,436 bbl., Viola 3,792-3,800 ft., T.D.

Stanolind 2 Peterson, SE SW NW 2-23-10w, pumped 116 bbl., Viola 3,730-45 ft.

Pioneer, Rice County: Aylward Prod. 1 Habiger, SW SW 24-19-10w, dry, T.D. 3,376 ft.

Stoltenberg, Ellsworth County: Cities Service 1-B Karlik, SW SW 8-16-10w, pumped 103 bbl., Arbuckle 3,311-22 ft.

Trapp, Russell County: Phillips Pet. 3 Roesner, NE SE 9-15-13w, pumped 503 bbl., Lansing 3,068-91 ft.

Witt, Russell County: Skelly 1-D Boxberger, SW NW SE 3-14-14w, pumped 284 bbl., Lansing 2,975-84 ft., 2,996-3,005 ft., T.D. 3,248 ft.

Wildcats

Barber County: Olson Oil 1 Axline, NE NE 16-31-11w, dry, T.D. 5,097 ft., Lansing 3,035 ft., Mississippi lime 4,505 ft., Viola 4,772 ft., Simpson 4,852 ft., Arbuckle 4,972 ft.

Barton County: Falcon-Seaboard 1 Holmes, N½ NW SW 1-20-14w, dry, T.D. 3,579 ft., Lamotte 3,229 ft., Arbuckle 3,501 ft.

Cowley County: Ingling & Parker 1 Eastman, SE SE SW 7-31-6e, dry, T.D. 3,405 ft., Bartlesville 2,822 ft., Mississippi lime 2,909 ft., Arbuckle 3,390 ft.

Deep Rock and Globe 1 Parsons, SW NW 24-32-3s, dry, T.D. 3,522 ft., sand and shale 3,094 ft., Mississippi lime 3,164 ft., Simpson 3,514 ft., Arbuckle 3,521 ft.

Kiowa County: Stanolind 1 Rinda Williams, NE NE 9-27-16w, dry, T.D. 4,877 ft., Lansing 4,024 ft., Viola 4,666 ft., Simpson 4,743 ft., Arbuckle 4,827 ft.

McPherson County: Globe Oil & Ref. 1-A Errickson, W½ SE SW 35-17-4w, dry, T.D. 3,705 ft., Mississippi lime 2,983 ft., Misener 3,450 ft., Viola 3,471 ft., Simpson 3,600, Arbuckle 3,663 ft.

Branine & Goering 1 Durst, NE SW 4-21-2w, dry, T.D. 3,635 ft., Lansing 2,355 ft., Mississippi lime 3,009 ft., Viola 3,485 ft., Simpson 3,515 ft., Arbuckle 3,595 ft.

Pratt County: Helmerich & Payne 1 Strait, NE NW SE 36-29-15w, dry, T.D. 4,751 ft., Lansing 3,985 ft., Viola 4,543 ft., Simpson 4,594 ft., Arbuckle 4,678 ft.

Reno County: Champlin Ref. 1 Jorgensen, SW SE SW 6-26-4w, dry, T.D. 4,123 ft., Lansing 2,805 ft., Mississippi lime 3,571 ft., Viola 3,999 ft., Simpson 4,022 ft., Arbuckle 4,110 ft.

Rice County: Helmerich & Payne 1 Staatz, SW SW SW 11-18-9w, dry, T.D. 3,423 ft., Lansing 2,880 ft., conglomerate 3,225 ft.

Rooks County: Three-Way Drlg. 1 Metropolitan Life, NW NW SE 17-6-20w, dry, T.D. 3,819 ft., Lansing 2,395 ft., Arbuckle 3,765 ft.

Russell County: N. Appleman 1 Driscoll, NE NE NE 4-15-14w, pumped 463 bbl., 38-gravity, Lansing 2,985-91 ft., discovery.

FOREST CITY BASIN

ST. JOSEPH, Mo. — Cities Service Oil Co. continues to work on its 1 Jim Cook, Bartlesville sand well in NW NW NE 32-65n-39w, Atchison County, Missouri. Plug was set at 1,430 ft. after the hole had filled 900 ft. with water at total depth of 1,454 ft. The well leaked 14 gal. of oil an hour and operators drove the plug to 1,449 ft. and then dumped 8 ft. of cement on top. Perforation of casing followed, results of which were not immediately learned.

Miller and Smythe have completed a new gas well in the McLouth pool, Jefferson County, Kansas. It is 1 Federal Land Bank in NE NW NE 29-9s-20e. The 6-in. pipe was set at 1,352 ft. and dropped to 1,443 ft., top of Bartlesville sand, and the well produced 10,500,000 cu. ft. of gas.

NEBRASKA COMPLETIONS

Gage County: Gage County Development Co. 1 Hurtz, NW NW SE 27-2n-7e, dry, T.D. 2,000 ft. in granite.

Richardson County: R. L. Ferguson and Edwin S. Towle 1 Catherine Tiehen, NE NW 24-1n-17e, dry, T.D. 2,531 ft., Hunton 2,381 ft.

NORTH LOUISIANA

Wildcat Activity Holds Interest of Operators

SHREVEPORT, La.—Completions in the North Louisiana-Arkansas area were off last week and the principal interest was in wildcat operations. In the New London pool of Union County, scene of the most activity in Arkansas, only one well was nearing completion. Marine Oil Co. 6 Frost, NE NE 12-18s-12w, had set casing to the pay level of 5,800 ft. and was preparing for completion tests.

Carter Oil Co.'s 8,000-ft. test, 1 Foyil, 3 miles southeast of the El Dorado pool, was drilling ahead at 3,700 ft. In the Nick Springs area the Fohs Oil Co. and Pilgrim Exploration Co. were drilling below 4,875 ft. at 1 Grace in 31-17s-14w. The well is considered a wildcat in that it is to be drilled to the Smackover lime, previously found at 6,819 ft. Present producing zone at Nick Springs is the Travis Peak, at 3,736 ft., with an average thickness of 30 ft.

ARKANSAS COMPLETIONS

Wildcats

Bradley County: Placid Oil 3 Murphy, SW SW 16-17s-10w, dry, T.D. 5,609 ft., porous lime 5,410 ft.

Placid Oil 1 Murphy, NE SE 3-16s-10w, dry, T.D. 5,673 ft. in red shale.

Macedonia, Columbia County: G. H. Vaughn 1 Jameson-Snider, S½ NW 20-18s-21w, flowed 200 bbl. condensate, Smackover 8,940-48 ft., T.D.

Arkansas Fuel Oil 1 Snider-Wise, SE SW NE 20-18s-21w, flowed 432 bbl., Smackover 8,839-80 ft., T.D. 8,901 ft.

NORTH LOUISIANA COMPLETIONS

Catahoula Parish: Hunt Oil 1 Louisiana Central, NE NW 19-9n-6e, dry, T.D. 5,632 ft., Wilcox 1,800 ft.

Madison Parish: C. H. Murphy, Jr., 1 Mahoney, NW SW SW 34-17n-13e, dry, T.D. 6,005 ft., Wilcox 2,238 ft., Lower Cretaceous 5,466 ft.

Caddo, Caddo Parish: Bayou State Oil 53 Brown, 27-20n-16w, dry, T.D. 845 ft.

J. C. Tippett 1 Lewis & Green, NW NW SW 27-20n-16w, dry, T.D. 1,079 ft.

T. H. Wilkinson 1 Spell, 35-22n-16w, flowed 35 bbl., T.D. 2,447 ft.

Sloan Wells 2-A Thigpen-Herold, SW SE SW 35-22n-16w, dry, T.D. 2,470 ft.

P. H. Carroll 1 Hurdle, 35-22n-16w, dry, T.D. 2,514 ft.

Haynesville, Claiborne Parish: Midstates 1 Waller-Beckett, SW NE 2-23n-8w, flowed 790 bbl., Pettit 5,350-70 ft., T.D. 5,435 ft.

Midstates 1-A Sherman, SW NE 13-23n-8w, flowed 456 bbl., Pettit 5,250-62 ft., T.D. 5,336 ft.

MISSISSIPPI

A report now available shows that Amerada Petroleum Corp. 1 Central Lumber Co., a wildcat completed dry in Franklin County, Mississippi, last November 27, topped the Vicksburg at 1,683 ft., Jackson 1,750 ft., Moody Branch 2,198 ft., Cockfield 2,235 ft., Cook Mountain lime 2,707 ft., Sparta 2,842 ft., Cane River 2,523 ft., Tallahatta 3,913 ft., Wilcox (approximately) 4,083 ft., Midway 7,432 ft., Selma 8,720 ft., Tuscaloosa 9,910 ft., Marine Tuscaloosa 10,382 ft., Glen Rose lime 10,962 ft. This test was drilled to a total depth of 11,802 ft.

OHIO, INDIANA

Wheeling Oriskany Field Extended Half Mile East

ZANESVILLE, Ohio.—Another large gas well gaging 11,700,000 cu. ft. has been completed in the Brush Creek pool by the Ohio Fuel Gas Co. on the R. F. Williams tract in Section 26, York Township, Morgan County. Top of the Clinton sand was reached at 4,232 ft., and drilling stopped at 4,260 ft., still in sand. The Wheeling Oriskany pool was extended ½ mile to the east by the Ohio Fuel 1 Ragan D. Welker, Section 25, Liberty Township, Guernsey County. The well gaged 2,010,000 cu. ft. Steiner et al completed another well in the Hinckley pool on the Fred Chatham tract in Lot 27, good for 2,100,000 cu. ft.

OHIO COMPLETIONS

Athens County, Lodi Township: H. B. Walker 2 Lewis Hounestine, Sec. 2, Berea, dry, T.D. 1,635 ft.

Coshocton County, Monroe Township: Upham Gas Co. 1 Isaac Conner, Sec. 5, Clinton, dry, T.D. 3,620 ft.

Fairfield County, Berne Township: City Nat. Gas 4 R. J. Conrad, Sec. 34, Clinton, 28,000 cu. ft., T.D. 2,183 ft.

Guernsey County, Liberty Township: Ohio Fuel 1 Ragan D. Welker, Sec. 25, Oriskany, 2,010,000 cu. ft., T.D. 3,286 ft.

Holmes County, Richland Township: Ohio Fuel 1 J. F. Fites, Sec. 5, Clinton, dry, T.D. 3,136 ft.

Knox County, Howard Township: H. E. Perkins 1 B. Winteringer, Lot 21, Clinton, dry, T.D. 2,678 ft.

Licking County, Burlington Township: National Drlg. Co. 3 Abraham Fulton, third quarter, Clinton, 50,000 cu. ft., T.D. 2,248 ft.

Mary Ann Township: Ohio Fuel 1 Ira E. Wolfe, Sec. 8, Clinton, dry, T.D. 2,643 ft.

Lorain County, Wellington Township: Ohio Fuel 1 Fred Abbott, Lot 1, Clinton, 112,000 cu. ft., T.D. 2,480 ft.

Medina County, Hinckley Township: Steiner et al 1 Fred Chatham, Lot 27, Clinton, 2,100,000 cu. ft., T.D. 3,267 ft.

Meigs County, Bedford Township: Ohio Fuel 1 Dayton Tubbs, Sec. 30, Berea, 64,000 cu. ft., T.D. 1,637 ft.

Morgan County, Marion Township: Bern O. & G. Co. 8 W. A. Huffman, Sec. 29, Berea 40,000 cu. ft., T.D. 4,809 ft.

York Township: Ohio Fuel 1 R. F. Williams, Sec. 26, Clinton, 11,700,000 cu. ft., T.D. 4,260 ft.

Pure Oil 4 Jesse Eppley, Sec. 28, Clinton, dry, T.D. 4,220 ft.

Perry County, Clayton Township: Preston Oil 1 Frank G. Rhoades, Sec. 7, Clinton, 40 bbl., T.D. 3,277 ft.

Industrial Gas 3 Anna M. Downey, Sec. 1, Clinton, dry, T.D. 3,470 ft.

Wayne County, Plain Township: Ohio Fuel 1 Isaac Batdorf, Sec. 24, Clinton, 104,000 cu. ft., T.D. 2,928 ft.

INDIANA

EVANSVILLE, Ind.—Superior Oil Co.'s efforts to develop Clore sand production in their 1 J. W. Carr et al, NW NW SW 29-4s-13w, Posey County, is still meeting with water trouble. A recent gage of the well showed 12 bbl. of oil and 48 bbl. of water in 8 hours on swab. Operators are still testing the well.

Hard formations are making drilling slow at the Roy Lee, trustee, 1 Oakland City College, E½ SE SW 3-7s-11w, Vanderburg County, which at last reports was drilling ahead below 1,780 ft. headed for the McClosky. The test is located about 3 miles south and a little west of Evansville and is approximately 2 miles from production in the Huesler pool.

The Continental Oil Co. 1 C. S. French, SE SE NW 12-3s-13w, was completed as a dry hole last week. No. 1 French, a Gibson County test, was drilled through the St. Louis lime to a total depth of 3,210 ft.

INDIANA COMPLETIONS

Gibson County: Continental 1 Young, SE SE NW 12-3s-13w, dry at 3,316 ft., Aux Vases sand 2,618 ft., Ste. Genevieve 2,652 ft., McClosky 2,674 ft., St. Louis 2,818 ft., Salem 3,099 ft.

Superior 1 J. F. Hull, SE NE SW 30-1s-11w, dry at 2,396 ft., Aux Vases 2,030 ft., Ste. Genevieve 2,264 ft.

Carroll Oil 3 Henry Crecelius, NE NW SE 36-1s-10w, dry at 1,420 ft., Glen Dean 1,281 ft., Hardinsburg 1,319 ft.

Pike County: Indiana Farm Bureau 1 C. T. Steen et al, SE SE SE 24-1n-7w, 150,000 cu. ft. gas, Cypress sand 825 ft., pay 832-42 ft., T.D. 842 ft.

Posey County: Tide Water 1 Swander, NE NW SE 34-3s-14w, pumped 1 bbl. oil and 75 bbl. water, shot 2,099-2,111 ft., Waltersburg 2,094-2,118 ft., T.D. 2,887 ft.

EASTERN KENTUCKY

ASHLAND, Ky.—Flood conditions in eastern Kentucky had little effect on drilling operations in this part of the state, although in some few sections high or back water caused some interference with work and travel conditions.

One oil well, a deepening operation, was reported this week with the completion data showing 20 bbl. of oil being produced daily. Other wells are near the completion stage with one being cleaned out, and another waiting for shot. Roads have been completed to three new locations.

EASTERN KENTUCKY COMPLETIONS

Pike County: Kentucky West Virginia Gas Co. No. 685 on Johns Creek, pumped 30 bbl. of oil a day, T.D. 1,250 ft. in Maxon.

CANADIAN FIELDS

Extension Test Under Way In North Turner Valley

CHATHAM, Ont.—Crude and natural-gasoline production from all Alberta fields for the week ending December 21 averaged 27,767 bbl. daily compared with 27,637 bbl. daily for the preceding week and 28,062 bbl. daily for the corresponding week of 1941. The daily average included 26,191 bbl. of crude and 1,073 bbl. of natural gasoline from Turner Valley and 503 bbl. of crude from other fields. There were 202 producing wells in Turner Valley and 32 in outside fields; with 31 drilling, one finished, two testing, one suspended, nine standing, one resumed, one abandoned, three new wells spudded and one drilling license issued.

Possibilities of the east flank of the North Turner Valley structure will be tested by Royalite Oil 66, LSD 6, 34-20-3w5, spudded and below 593 ft. Location is an easterly offset to Major Oils 1 producer, and in line with the Foothills Oil & Gas producers in 27-20-3w5, to the south. Completion of a producer at this point will encourage further development in a considerable area east of the proven field.

Home Oil Operations

Home Oil Co., with 11 producing wells in North Turner Valley, is the second largest oil producer in Canada, with an output for the first 11 months of 1942 totaling 1,035,364 bbl. bringing the total since the company resumed operations some 4 years ago to over 3,000,000 bbl. Home Oil 2, the first completion, up to December 15 had produced 966,931 bbl. of crude, and is still one of the largest wells in the field. The company, which holds extensive unproven acreage in North Turner Valley, has three wells drilling, in addition to six being drilled on its acreage by other companies. The Home company has a participating interest in the Devonian test now drilling in Central Turner Valley, and is jointly interested with Anglo-Canadian Oil Co. in a proposed test on the Walton Creek structure. This area, in the foothills north and west of Calgary, is similar structurally to the Turner Valley field. Drilling there will start early in 1943.

Drilling Period Extended

An order-in-council of the Alberta Government passed recently provides for extension from 12 to 18 months of the period allowed for exploratory work on well sites, and also provides for extension of rental credit by the Government to offset the first year's drilling operations. These measures are being taken to assist in the discovery of oil and gas for wartime purposes. Previous to the new order, permits were issued to lessees for a 1-year period, with a 4-month extension on payment of a rental of 25 cents an acre provided geological or geophysical work was continued. Under the new arrangement, a lessee may obtain a 6-month extension of the exploratory period with the rental satisfied from any credit established as a result of drilling expenditures. The area for each well for which credit is allowed must not exceed 50,000 acres to be within 15 miles of the well location.

Tilley Field

Imperial Oil is continuing its efforts to develop an extension of the Tilley field in eastern Alberta. The first oil showings were encountered early in 1942, but of seven wells drilled, only Northwest 2 is now producing, with an output of 236 bbl. in October. The field produced a total of 8,262 bbl. up to October 31. In efforts to extend production two dry holes have been

drilled in the Monogram area. Farther to the west, Imperial-Rolling Hills 1, LSD 1, 10-14-13w4, is coring in the lime below 4,216 ft. South of the Rolling Hills well, Imperial-Armelgra 1 is being started in LSD 16, 19-13-13w4, using light rotary outfit. The rig from the abandoned Imperial-Monogram 1 is being moved to a new location for Imperial-Grantham 1, LSD 1, 29-13-15w4, about 11 miles west of the Armelgra well. The producing horizon in the Tilley field is around 3,180 ft.

In southern Saskatchewan, Northwest-Radville 1, LSD 16, 36-5-19w2, at 6,062 ft. is bailing down fluid for a test.

MICHIGAN

Michigan Oil Advisory Board To Discuss Production Rates

SAGINAW, Mich.—"In the interests of preserving Michigan's oil supply by proper adjustment of production rates," the Michigan Oil Advisory Board will conduct a public hearing January 27 in Lansing, it has been announced by P. J. Hoffmaster, state supervisor of wells. A technical committee also will report on feasibility of repressuring wells by returning casinghead gas to the structures.

The hearing follows announcement that Michigan's January production quota has been set at 63,700 bbl., a figure oil men doubt can be attained. The state has been falling below its federally assigned quota for the past several months.

Recent developments did little to improve the downward trend of production as the best of the latest seven oil-producing completions rated about 500 bbl. a day. That well was drilled in Osceola County. Three more producers were reported from the Kawkawlin field of Bay County and three small natural gas wells also were developed in the state.

In the past 2 weeks the state Conservation Department issued 19 drilling permits, putting the 1942 total at 563, or only about half the number for the preceding year.

MICHIGAN COMPLETIONS

Arenac County, Adams Township: Basin Oil Co.-Don Rayburn 1 Demura, C SE NW 25-19n-3e, 3 bbl. natural, T.D. 4,328 ft.

Bay County, Kawkawlin Township: Gulf Refining Co. 1 Fontaine, C N½ SW NE 33-15n-4e, 125 bbl. first 11 hr., acidized; T.D. 2,943 ft.

Isabella County, Vernon Township: Nollem Oil & Gas Corp. et al 5 House, NE NW NW 26-16n-4w, pumping 30 bbl. and salt water, natural; T.D. 3,743 ft.

Lake County, Pleasant Plains Township: W. Spencer Cook 1 Lannings, C N½ NW SE 30-17n-13w, wildcat test, dry, T.D. 2,953 ft.

Van Buren County, Bangor Township: Socony-Vacuum Oil Co., Inc., 1 Merriman, Hanes & Haney, SW NE SE 9-2s-16w, dry hole, T.D. 1,019 ft.

Mecosta County, Martiny Township: Gordon Oil Co. 1 Helmer, C N½ NE NE 17-15n-8w, wildcat test, dry, T.D. 3,925 ft.

(Previous Week's Completions)

Arenac County, Clayton Township: Arenac Oil & Gas Co. 1 Barnes, Sec. 8, 2,880,000 cu. ft. natural gas, T.D. 1,213 ft.

Bay County, Kawkawlin Township: Chapman Oil Co. 1 Dore, Sec. 33, pumping 30 bbl., acidized, T.D. 2,951 ft.

Gulf Refining Co. 1 Paige, Sec. 35, 25 bbl. first 13 hr., acidized, T.D. 2,933 ft.

Huron County, Paris Township: Mercer Drilling Co. 1 Citizens Bank, Sec. 14, dry, T.D. 2,400 ft.

Isabella County, Broomfield Township: L. & S. Drilling Co. 1 Nickolson, Sec. 13, 500,000 cu. ft. natural gas, T.D. 1,366 ft.

Kent County, Gaines Township: James J. McGerry, Tr., 1 Brown, Sec. 30, dry hole, T.D. 2,175 ft.

Mecosta County, Fork Township: Belvidere Oil Co. 1 State, Sec. 11, 1,010,000 cu. ft. natural gas, T.D. 1,489 ft.

Missaukee County, Norwich Township: Sun Oil Co. 3 Horner, Sec. 14, 35 bbl., acidized, T.D. 3,096 ft.

Osceola County, Osceola Township: Sun Oil Co. 1 Rohrer et al, Sec. 26, 422 bbl. first 21 hr. natural,, T.D. 3,705 ft.

Van Buren County, Bangor Township: Harris Oil Co. 1 Bryce, Sec. 4, dry hole, T.D. 1,033 ft.

OKLAHOMA

Hunton Lime Pool Opened In Pottawatomie County

THE new year was started in Oklahoma with considerable wildcat activity, indications of a further increase, and at least one new oil pool in sight. Also a number of wildcats were in the process of completion, with shows of either oil or gas, as the week ended.

Continental Oil and Kerlyn Oil 1 Weaver, NW NE NE 32-8n-3e, south of the town of McComb and a mile southwest of the McComb pool, was the center of interest last week when it filled 3,200 ft. with oil on a drill-stem test at 4,670-4,701 ft. The well flowed into pits after perforating the Hunton lime at 4,664-80 ft. and in 1 hour and 40 minutes produced 177 bbl. of oil. Opened for 40 minutes it flowed 127 bbl. It was then shut in for 40 minutes and when opened again flowed 50 bbl. in 20 minutes. The well was shut in until storage tanks are erected. Both Wilcox zones were dry, the second at 5,451 ft., total depth, and the hole was plugged back to the Hunton.

The first new oil well claimed for the state in 1943 extended the Pauls Valley pool of Garvin County ¼ mile on its northwestern trend. Ohio Oil Co. 1-B Huckaby, SE SW NE 25-4n-1w, flowed 38 bbl. of oil in 1 hour through tubing from Wilcox sand at 4,075 ft., total depth.

New Gas Pool in Sequoyah County

The Western Oklahoma Gas Co. of Fort Smith, Ark., opened a new gas pool in southeastern Oklahoma last week at its wildcat in the NW NE SW 1-10n-24e. The test, scheduled for the 2,800-ft. gas zone found in the general area, reported an estimated 3,000,000 cu. ft. of gas at 1,500 ft. However, the gas was shut off and the well was being deepened toward the lower pay. Location of the well is a mile southwest of the Gans field and 6 miles southeast of Sallisaw. The company is reported to have some 3,000 acres leased.

Sun Oil Co. has staked location for its 1 Stout, SE SE SE 18-5s-7e, in the prolific Cumberland pool of Marshall and Bryan counties. This is the first test to be made by outside interests since the discovery of the pool by the Pure Oil Co. Location of the well is on the northwestern trend in Marshall County.

OKLAHOMA COMPLETIONS

Wildcats

Garvin County: Bradley 1-B Brundate, NW NE SW 10-4n-3e, dry, T.D. 2,715 ft. in Pennsylvanian.

Jefferson County: Fidelity 1 Gover, NW SE 3-4s-9w, dry, T.D. 3,996 ft., Arbuckle 3,925 ft.

Haskell County: Mulhall 1 Billington, NW NW 31-9-19e, dry, T.D. 1,803 ft.

Hughes County: Phillips 1 Jessee, NE SE NW 21-8n-11e, dry, T.D. 3,733 ft., Cromwell 3,678 ft.

Jackson County: Burnham 1 Hall, NW NW 20-1n-20w, dry, T.D. 3,246 ft.

Noble 1 Mayrhofen, NE SW 32-2n-23w, dry, T.D. 7,503 ft.

Kay County: Bogan 1 Vanselous, SW SW 27-25n-1e, dry, T.D. 3,212 ft., Layton 3,097 ft.

Kiowa County: Russell 1 Campbell, NW SW SW 36-7n-14w, dry, T.D. 1,191 ft., Viola 1,178 ft.

Lincoln County: Morgan & Flynn 1 Bonebrake, NW NE 32-17n-5e, dry, T.D. 4,093 ft., show oil 1,150 ft.

Wilcox 1 Battle, SE NE 30-14n-5e, dry, T.D. 4,929 ft., second Wilcox 4,914 ft.

Fain-Porter 1 Rogers, SW SE NW 21-15n-6e, dry, T.D. 4,353 ft., Hunton 4,144 ft., Viola 4,240 ft., Wilcox 4,287 ft., second Wilcox 4,340 ft.

Oklahoma County: Kubat 1 Sanders, SE NE NE 33-11n-1e, dry, T.D. 6,352 ft., Hunton 5,780 ft., Wilcox 6,302 ft., second Wilcox 6,327 ft.

Payne County: Blackwell 1 Goldsty, SW NE 2-17n-4e, dry, T.D. 4,243 ft., Viola 4,112 ft., Wilcox 4,170 ft., second Wilcox 4,200 ft.

Pottawatomie County: Traugh 1 School Land, SW SE NW 16-6n-5e, dry, T.D. 3,212 ft., Cromwell 3,145 ft.

Seminole County: Hughes 1 Grogg, NE SW 18-11n-8e, dry, T.D. 3,633 ft., Cromwell 3,626 ft.

Fields

Cement, Caddo County: Ohio 8 Rigney, NE SW SE 12-5n-9w, pumped 56 bbl., pay 3,990-4,048 ft.

Comanche, Stephens County: Pace 1 Carney, NW SE 20-2s-7w, 20,000 cu. ft. gas, T.D. 1,836 ft.

Cushing, Payne County: Oklahoma Gaso Plants 3 Minnich, NE NE 3-18n-6e, dry, T.D. 3,466 ft.

Garber, Garfield County: Sinclair Prairie 24 Crews, N½ SW SE 19-22n-3w, pumped 1 bbl., sand 2,012 ft., T.D. 2,198 ft.

Liberty, Noble County: Deep Rock 3 Schultz, NE SW 9-22n-2e, dry, T.D. 4,541 ft., Viola 4,469 ft., Wilcox 4,535 ft.

Oklahoma City, Oklahoma County: Russell 1 Booth, NW SW SW 22-12n-3w, pumped 275 bbl., Wilcox 6,470 ft., T.D. 6,534 ft.

Romulus townsite, Pottawatomie County: Smith 1 DeGraff, SW NW 1-7n-3e, dry, T.D. 5,128 ft., Viola 4,752 ft., second Wilcox 5,086 ft.

Seminole, Seminole County: Oklahoma Oil 1 Tiger, NW NE 13-9n-6e, flowed 224 bbl. through 1-in. choke, Hunton 3,952 ft., T.D. 3,983 ft.

Wewoka townsite, Seminole County: Jordan 2 Terrell, N½ SE NE 17-8n-8e, flowed 152 bbl., Wilcox 4,254 ft., T.D. 4,275 ft.

Among the Drilling Contractors

Clardy Transferred to PAW Pipe-Line Operations

BRUCE C. CLARDY, formerly a member of the firm of Heyser, Heard & Clardy, Inc., oil-well drilling contractors, Dallas, Tex., who has been serving as regional manager of the War Production Board conservation division, has been transferred to the Petroleum Administration for War in Washington, as chief of the pipe-line operations section.

BRUCE C. CLARDY

Mr. Clardy will have charge of the purchases and sales of crude oil and refined products which will flow through the government-owned War Emergency Pipelines, Inc. The Government will buy the products at one end of the line and sell at the terminus and the pipe line will not be considered a common carrier. The Defense Supplies Corp. will do the buying and selling and the Defense Plant Corp. owns the government pipe lines which will be operating under the Petroleum Administrator for War.

The first government pipe line to go into operation will be the 24-in. line from Longview, Tex., to Norris City, Ill., which will be filled some time in January, Mr. Clardy said. Other lines to be operated are across the upper Florida Peninsula and a system from Corpus Christi to Houston, Tex.

At one time Mr. Clardy was with Shell Petroleum Corp. (now Shell Oil Co., Inc.). He has also served with the Texas Railroad Commission in oil and gas conservation work. An alumnus of University of Texas. He has been associated with the petroleum industry in Texas for the past 20 years.

Rowan Drilling Co., Fort Worth and Houston, Tex., has staked location for its 19 Jamison in the Danbury field, Brazoria County, Texas. The test, projected to go 6,000 ft., is on a 1,296-acre tract in the Henry Austin Survey 6.

Parker Drilling Co. has the contract for Amerada Petroleum Corp. 1 Lewis House, in C SE NW 2-1n-3w, north of the Robberson pool, Garvin County, Oklahoma, which was drilling near 7,000 ft.

Olson Drilling Co., Tulsa, was preparing to drill its 3 Sealy-Smith Foundation, a 5,700-ft. test, to the Tubbs pay in the Monahans field, Ward County, Texas. Location is ¼ mile west of the 2 Sealy-Smith, discovery of the Tubbs production in the pool. Well will be started with spudding machine for setting surface pipe after which a rotary rig will be put in operation.

Houston Drilling Corp., Houston, Tex., finished a 140-bbl. producer for Gulfboard Oil Corp. in the West Mauritz field of Jackson County, Texas. It was Gulfboard A-1 Mauritz Brothers, in the M. L. York Survey, bottomed at 5,582 ft.

Dixie Drilling Co., Houston, Tex., has two strings of tools running for Texas Co. in the Erath field, Vermilion Parish, Louisiana. One is on 1 Brousard, in Unit C, and the other is on 1 Hulin, Unit D. Dixie is rigging up on another contract for Atlantic Refining Co., 7 St. Mary, in the Bayou Sale field, St. Mary Parish, Louisiana.

Morris-Hamilton Drilling Co., Houston, Tex., is completing 4 Gray, for Union Oil Co. of California, in the Vinton field, Calcasieu Parish, Louisiana, at 5,500 ft.

Rowan Drilling Co., Fort Worth, Tex., is working on two offsets to the discovery well in the Quitman pool of Wood County, Texas, being drilled for Shell Oil Co., Inc. Shell 1 Blaylock, S. G. Purse Survey, spudded over the week end and the 1 J. B. Goldsmith, W. W. Lanier Survey, was scheduled to start early this week.

Duncan Drilling Co., Big Spring, Tex., has contract for the Col-Tex 1 Stewart, SW SW 211-97, H.&T.C. Survey, Scurry County, Texas, 7 miles

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northeast of the Sharon Ridge field. The wildcat will be drilled with rotary to approximately 4,200 ft.

Olson Drilling Co. spudded 295 ft. to start J. I. and P. D. Moore 1 Amerada-J. S. Todd estate, a 7,500-ft. wildcat test, 660 ft. from the south and west lines of Section 16, Block YZ, E.L.&R.R. Co. Survey, western Crockett County, Texas. A rotary will be used to drill below the surface pipe.

Pohland Drilling Co. had cable tools rigged up to drill the J. I. and P. D. Moore 1-12 Shannon estate, 660 ft. from the north and west lines of Section 12, Block Q, John Small Survey, Crockett County, Texas. The test is scheduled to go to 2,500 ft.

Bill Rapp, of Shawnee, Okla., has the contract for Danciger Oil & Refining Co. and Fau-Kern Development Co. 1 Rinehart heirs, in C NE NW 21-20n-7e, near Jennings, Pawnee County, Oklahoma. Contract depth is to the Bartlesville or 2,860 ft. Surface pipe has been set.

Noble Drilling Co. was moving in for the 1 Herron, in C NW NW 11-4n-24w, west of Blake, in Greer County, Oklahoma. It is on a 2,500-acre farmout from Stanolind Oil & Gas Co., and is contracted for 4,000 ft.

J. S. Pittman, McCamey, Tex., began drilling last week on the J. I. and P. D. Moore 1-21 Amerada-Shannon estate, 660 ft. from the south and west lines of Section 21, Block YZ, E.L.& R.R. Co. Survey, Crockett County, Texas. A cable-tool rig is being used.

Portable Drilling Co. had the contract on B. V. Murray et al 1 Barnes, in C SW SE 19-13n-5e, near Sparks, Lincoln County, Oklahoma, which drilled to 5,001 ft., in second sand. Casing was being run to 4,987 ft., and pipe was to be perforated around 4,950 ft.

Seminole-Canadian Drilling Co. has set surface pipe at its 1 Mathis, in SE SE SW 6-6n-6e, Seminole County, Oklahoma, on a spread of 280 acres of leases. Harry Culver and associates own the Seminole-Canadian company. The well is contracted for the Wilcox sand or 4,200 ft. Amerada Petroleum Corp. and Atlantic Refining Co. are supporting the deal.

Golding-Farris Drilling Co., Houston, Tex., finished 1 McCrory & Westhoff, in the Mayo field of Jackson County, Texas, and the rig has been moved to another location in the same area to drill 3 Meyer, which was spudded late last week. Both wells are for Stanolind Oil & Gas Co. Golding-Farris was completing another Stanolind well, 17 Vandenburg & Hill, in the East Placedo field, Victoria County, Texas, at 6,800 ft.

Harry L. Edwards Drilling Co., Houston, Tex., is starting a wildcat well it has contracted to drill for Phillips Petroleum Co., the 1 Annie B. Renchie, in the Millican area, William Devers Survey, of Brazos County, Texas. Phillips has been active in this district and brought in a gas well, 1 Mitchell, at 5,001 ft., establishing the prospect as a salt dome. The 1 Renchie is projected to go 7,500 ft. Coring operations have prolonged the work on a semiwildcat test which Edwards is drilling for Cities Service Oil Co. near Blessing, in Matagorda County, Texas. This hole, projected to 9,000 ft., is at 8,000 ft. Edwards tools are at 5,000 ft. in another Cities Service well, the 1 Chamrad, in the North La Ward field, Jackson County, Texas.

Moran Drilling Co. has the contract for the Danciger Oil & Refining Co. 1 Moody, in C NE SE 28-5n-3e, McClain County, Oklahoma, which was drilling below 2,500 ft. It is contracted for the Viola lime or 3,600 ft.

Housh & Thompson, Houston, Tex., have reached 4,700 ft. on O. W. Killam 1 M. A. Dodd, a wildcat test in Harris County, Texas, 6 miles north of Addicks and 4 miles southeast of the Josh Richardson field. The test is to go to 7,500 ft.

George Pace, Duncan, Okla., has the contract for Harry Culver et al 1 Rennie, in SW NE NE 20-3n-1e, south of Pauls Valley, Logan County, Oklahoma, in which surface pipe has been set. Drilling was resumed last week after a delay caused by unfavorable weather.

Kerr-McGee & Co. has been awarded the contract for Ace Gutowsky and D. D. Bourland 1 Wagner, in NW NW SW 32-14n-4w, west of the Edmond field, which was ready to spud. Contract is for the second Wilcox or 7,500 ft. Kerr-McGee also has the contract for Mid-Continent Petroleum Corp. 1 Fromouth, in C SE SE 21-8n-3e, a mile east of the Macomb townsite, in Pottawatomie County, Oklahoma, which was drilling below 4,770 ft.

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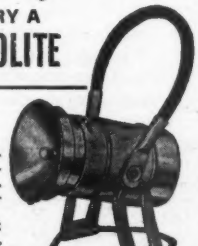

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PERSONALS

Lt. Col. Fred P. Clark, who before the war was engaged in the oil business at McCamey, Tex., with his brother, **Harold M. Clark,** returned to his home in San Angelo, Tex., for a visit last week. He has been at Camp Bowie, Texas, since attending the tactical and gunnery school at Fort Sill, Oklahoma, earlier in the year.

Allen Flaherty, formerly independent oil operator and drilling contractor at Midland, Tex., returned to Midland for a visit from Camp Claiborne, Louisiana, where he has been on Army duty. He holds a commission as a lieutenant.

Lem Peters, oil producer and wildcatter of Midland, Tex., has traded his oil maps for air maps for the duration of the war, and is serving as a flight dispatcher in the Ferry Command of the Army Air Force at Love Field, Dallas, Tex.

Ernest H. Smith, California Arabian Standard Oil Co.; **Bob McCool,** Trinidad Leaseholds, Ltd.; **M. H. Hobbs,** Nederlandsche Koloniale Petroleum Maatschappij (Standard-Vacuum) and **J. C. B. Vandenberg,** Bataafsche Petroleum Maatschappij (Shell), were

R. W. McCool, Ernest H. Smith, Kenneth Walker, and M. H. Hobbs

among foreign oil operating guests of the Los Angeles Nomads chapter last month. **Dr. Kenneth Walker,** lecturer, author, philosopher and a Nazi prisoner, was the principal speaker. He told of three interviews with Hitler and experiences with the Gestapo and Neuremberg incarceration.

L. F. Scherer, assistant chief engineer for Texas Co., in Houston, Tex., was in charge of a program devoted to pipe-line work at the December meeting of the Houston Engineers Club. A feature of the program, sponsored by Texas Co., was a sound picture, "Pipe Line," showing in technicolor, transportation of oil from the well to its final destination.

Sam Hulse has been made vice president in charge of sales for Warren Petroleum Corp., Tulsa. He became associated with Warren in 1936. **John T. Oxley,** manager of the gas measurement department, and assistant secretary, has been made secretary, taking over some of the duties of **Howard Felt,** vice president, who has been secretary and manager of the liquefied petroleum gas division.

Frank G. Evans, who was research geologist for Shell Oil Co., Inc., in Houston, Tex., is now a lieutenant in the U. S. Naval Reserve. Upon completion of a course in aerial navigation at the naval training school in Coral Gables, Fla., Lieutenant Evans expects to be assigned to the school as an instructor.

Paul J. Calvert, superintendent of the Owensboro-Ashland Co., crude-oil gathering system, owned jointly by Ashland Oil & Refining Co. and Standard Oil Co. of Ohio, was recently appointed general superintendent of the pipe-line and production department of the Ashland company in eastern Kentucky. Mr. Calvert retains the former position which he has held since 1939 and will make his headquarters at Ashland, Ky.

S. R. Clinkscales, chief of the Materials Division in the Tulsa branch office, District 2, Petroleum Administration for War, advises that the photographer who furnished what was purported to be his picture must have been caught off base with the Journal an unwitting accomplice. Anyway, the picture on page 52 of the December 31 Journal was of **V. C. Canter,** a former associate of Mr. Clinkscales before he was granted a leave of absence from Frick-Reid Supply Corp., to accept the PAW assignment.

S. R. CLINKSCALES

FRANK W. PIERCE

Traveled Personnel Route to Become Jersey Director

FRANK T. PIERCE, a new director of Standard Oil Co. (New Jersey) rose to his present high executive post with the world's largest oil company through the school of industrial and personnel relations.

He joined the Standard of New Jersey organization in 1924 as assistant to C. J. Hicks who at that time was executive assistant to the president in charge of industrial relations. Mr. Pierce succeeded to manager of this department in 1933 and continued in that capacity until he became a director in December 1942. During his 18 years in the industrial relations department, Mr. Pierce traveled extensively to all parts of the world where his company conducts operations.

Before joining Standard of New Jersey, he was employed by Goodyear Tire & Rubber Co. During that time, he traveled in the West Indies and South America and, after the war, was placed in charge of the Goodyear company's newly organized interplant relations department. Experience gained in the personnel and industrial-relations field in Latin America qualified Mr. Pierce for many of the duties he was assigned with Standard of New Jersey which has extensive producing operations in Venezuela and Argentina and one of the largest refineries in the world on the island of Aruba, a Netherlands possession.

A. Clarke Bedford of New York became general sales manager of the Standard Oil Co. of New Jersey and its affiliates on January 1. Since 1936 he had been assistant general sales manager, working under **R. T. Haslam,** who was recently elected a director of Standard Oil Co. (New Jersey). Mr. Bedford has been engaged in sales work since 1920 when he was made a member of the marketing committee of the Jersey company. Prior to that, and following his graduation from Williams College in 1913 he had been engaged in refining, accounting and production work for various company interests. He served with Carter Oil Co. as secretary and assistant treasurer before joining the Jersey company marketing committee. In 1926 he became joint manager of the domestic sales department and in 1927 went to New Orleans as a vice president and director of the Standard Oil Co. of Louisiana. Four years later he went to Boston as president of the Colonial Beacon Oil Co., and in 1933 returned to New York as sales coordinator, continuing as president of Colonial Beacon. Three years later he became assistant general sales manager.

A. C. BEDFORD

Lt. Col. Wilson G. Saville, acting district engineer for the Army in the Galveston, Tex., district since December 4, has been appointed district engineer, succeeding **Col. L. H. Hewitt.** Colonel Saville, a West Point graduate, resigned from the Army in 1918 and for 20 years preceding last March he was a consulting geologist and geophysicist, with offices in Houston, Tex. He reentered the Army last March.

Lt. John N. Garrett, hero of war adventures in Africa which have carried his name into newspaper headlines throughout the country, was an engineer in the Wallace & Tiernan Co. organization, Houston, Tex., before he joined the armed forces last April. He is well known among oil producers, refiners, and operators of recycling plants in the Gulf Coast territory, where he supervised installation of chlorination units. Lieutenant Garrett lived in Nutley and Newark, N. J., before he went to Houston.

C. H. McNair, traffic manager for Humble Oil & Refining Co., Houston, Tex., is chairman of a transportation advisory committee for that city announced by the Office of Defense Transportation.

John Hamman, Jr., of Houston, Tex., last week announced that Hamman Oil & Refining Co. has succeeded to the business of Hamman Exploration Co., taking over all assets and assuming all valid liabilities on December 29.

D. J. Harrison, Houston, Tex., president of the Harrison Oil Co., announced he would continue in the oil business and operate as an independent following the sale of the concern's holdings last week to Magnolia Petroleum Co.

W. Stewart Boyle, Houston, Tex., has sold his oil and gas wells in Jackson County, Texas, to **Morris Raush, Louis** and **Harry Pulaski** and **H. M. Cohen,** all of Houston. Consideration was about $400,000 and the deal involved 17 oil and gas wells and 1,500 acres of leases in seven Jackson County fields. Properties are in the Mauritz, South Mauritz, Mayo, Stewart fields and in the Hoffman and La Salle extensions of the West Ranch pool.

R. G. Follis, T. S. Petersen and **F. S. Bryant,** each with service records of 20 years or more, became vice presidents of Standard Oil Co. of California at last week's meeting of the board in Los Angeles, Calif. Mr. Follis, first employed by the company in 1918, became a director last spring and has been general manager of the manufacturing department. Mr. Bryant has been a director and assistant to the president since 1940. Mr. Petersen became assistant to the president in charge of employe relations and personnel in 1938, was appointed manager of the marketing department in 1941 and became a director in 1942.

J. F. M. Taylor and **H. Bloemgarten** became vice presidents of the Shell Oil Co., Inc., east of the Rockies, effective January 1. Mr. Taylor, as vice president of manufacturing,

J. F. M. TAYLOR

H. BLOEMGARTEN

succeeds **E. D. Cumming,** who has been granted an indefinite leave of absence and was recently appointed director of refining under the Petroleum Administrator for War. Mr. Bloemgarten, who for the past year has been special assistant to the president in exploration and production operations, will continue to deal with this phase of the business in his new capacity.

Freeman W. Burford, former Dallas, Tex., oil man and now with the U. S. Army in New York City, has been promoted from major to lieutenant colonel. He is executive officer of the Second Transportation Zone of the Army. Several years ago he was president of the East Texas Refining Co., Longview.

William T. Regan, Standard Oil Co. of New Jersey engineering department, Bayway, N. J., has been made chairman of the Sons of the American Legion national committee.

R. G. Follis, T. S. Petersen, and F. S. Bryant, new vice presidents of Standard Oil Co. of California

Market Developments

East Coast

NEW YORK.—With tank-car deliveries at their lowest level since coupon rationing was undertaken to distribute the limited oil products to East Coast consumers, the supply situation in District 1 continued this week to grow more critical. Tank-car shipments in the week ended December 26 were only 700,827 bbl. per day, the lowest since the week of June 6.

Recent reductions in the value of gasoline-ration coupons tended to ease difficulties with respect to this product but supplies were reported to be still very scarce, particularly in the metropolitan New York area. Residual fuel oil also was tight and kerosene, much in demand in the New England area, was likewise scarce. Concentration of a greater volume of shipments to New England is expected to develop some relief for that area after emergency steps were taken last week to alleviate a severe, immediate shortage.

The latest action of the PAW in issuing Order 1 which restricted deliveries of gasoline, kerosene, light and heavy fuel oil developed additional confusion and met with opposition from distributors. The opposition was based on the fact that the order froze existing conditions when flexibility was one of the greatest needs. Confusion developed as a result of the appended priority system which some distributors found impossible to define.

Gulf Coast

HOUSTON, Tex.—Beginning of the new year found refined-oil markets in the Gulf Coast territory generally firm and in the case of the fuel oils and kerosene extremely tight. Gasoline, which had been displaying unexpected strength, was a little easier and offerings were more frequent.

Lubricating oils, which had seemed to become a market problem, were referred to more cheerfully this week. Although there has been a pronounced drop in the demand from the automotive field, owing to the decreasing civilian use of automobiles, the Army and Navy requirements have grown, with the result that they have gone far toward compensating for markets lost through gasoline rationing.

Moderate backing up of gas-oil stocks in the Corpus Christi area was reported, but it was attributed to lack of facilities for transportation and not to absence of demand. Refiners did not exhibit serious concern.

Kerosene and No. 2 fuel oil continued at a premium. The demand is so insistent that refiners themselves have no difficulty in obtaining ceiling prices for these products. As a consequence reports indicate that none is being handled through marketers.

Notwithstanding measures taken by the Office of Defense Transportation designed to bring empty tank cars back to the Gulf Coast from the East more promptly, refiners and marketers say the situation shows no improvement.

Mid-Continent

CONCERN of buyers over near and long-term outlook for petroleum supplies continued this week to feature negotiations in the Mid-Continent refinery market. Suppliers reported firm offers at fixed or going prices over the next several weeks. Contract customers were seeking through various inducements to increase their future deliveries of fuel oil, a development in the market that refiners are resisting.

The recent Petroleum Administration order requiring Mid-Continent and other interior refiners to increase their production of residual fuel oil by 7 per cent over the yields prevailing during the last half of 1941 injected new complications into the manufacturing picture. Lifting production of heavy fuel oils to 28 to 30 per cent of the crude charged at interior refineries will cause a substantial diminishment in the yield of gasoline and the outlook for motor fuel, currently available in adequate quantities in all parts of the country except the East Coast, may be drastically revised before next summer passes.

Railroads are the chief seekers of additional fuel oil. Practically all roads in the Middle West and southwestern states are attempting to increase their supplies to cope with the faster and heavier traffic required under wartime conditions.

Practically all fuel-oil marketers in the Middle West had raised tank-wagon prices this week by the 0.3 cent per gallon authorized by the Office of Price Administration. The price advance, effective December 29, applies to all grades of fuel oils marketed in the 30 rationed states.

Prices on other products continued steady this week.

Pacific Coast

LOS ANGELES, Calif.—The general refinery market remained dull and featureless this week. Refiners are watching for more tangible evidence upon which to appraise their 1943 essential-civilian requirements.

Natural gasoline continues one of the tightest products in the entire market. Manufacturers are unable to satisfy all demand and are declining to quote on a considerable volume of potential business.

Demand remains brisk for fuel oils. The slight increase in fuel-oil stocks during the past 2 months in the California refineries reflects greater runs of light crudes and the substantial reductions at some plants in the percentages of gasoline manufactured. Stocks of light, refinable crude have been lowered 3,000,000 bbl. during the past 2 months, indicating the trend to production of residual fuels from the higher quality oils, in lieu of heavier raw material.

Stocks of diesel fuel and other distillate-fuel oils were reduced 214,437 bbl. in November and another draft on inventory is indicated by the preliminary figures for December. This liquidation of stocks indicates continued high demand for light fuels and the policy of refining companies in the use of such material for blending residuals up to specifications of the Navy.

A.P.I. REFINERY REPORT

Week Ended December 26, 1942

(Figures in thousands of barrels.)

	Dly. crude runs to stills	Stocks: Gasoline	Stocks: Residual	Stocks: Gas oil
Appalachian	153	2,741	462	744
Ind., Ill., Ky.	684	14,636	2,049	5,606
Okla., Kan., Mo.	341	6,229	1,333	1,913
Censored area*	1,577	36,769	13,356	22,844
Rockies	99	1,508	552	354
California	671	18,345	55,210	12,338
Total 12-26-42	3,525	80,228	72,962	43,799
Total 12-19-42	3,667	79,131	74,205	45,880
Total 12-27-41	4,103	82,806	94,216	50,806

Note: Refinery runs and stocks for week ended January 2, 1943, appear on Trends page.

*Reports combined on East Coast, Texas Gulf, Louisiana-Arkansas and Inland Texas at request of PAW.

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended:	Bbl. of crude*
December 26, 1942	233,227,000
December 19, 1942	†232,457,000
December 27, 1941	243,990,000

*Excludes heavy, unrefinable stocks in California. †Revised.